FLIGHT and The AIRCRAFT ENGINEER

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The Outlook

Watching the Muster

A VERY spirited broadcast was given recently by a Group Captain of the R.A.F. who described the mustering of squadrons and wings of fighters and bombers for a daylight sweep over Northern France. Incidentally, he mentioned that at first it had not been easy to provoke the *Luftwaffe* fighters into disputing the British right of way, but that when our heavy bombers went over they could not be disregarded. He also made the point that the ratio of casualties between the enemy and ourselves was almost certainly more favourable than the official figures showed. Not all of our reports of fighters missing meant the death of the pilot, for a lucky shot in the engine would usually force the man to jump with his parachute and be taken prisoner. On the other hand, many damaged enemy machines were likely to be complete losses, but the British airmen were too busy to watch them crash. These are the penalties of fighting over hostile country—but the advantages outweigh the disadvantages.

Perhaps the most striking part of the broadcast was that which described the assembly at the rendezvous over some part of Kent, and the cheer which the sight gave to the people of that county. On the other side of the Channel, those Frenchmen who are constantly being told by their German protectors that Britain is beaten, now see with their own eyes that the R.A.F. is very much a striking force, and constantly growing in its punishing power.

The Group Captain explained what a complicated piece of staff work it is to assemble all the squadrons and wings, and no doubt any suggestion of making that work still more complicated would not be welcome. All the same, if it could be arranged without undue trouble for at least part of the R.A.F. force to show itself over London, particularly East London, either before setting off for France or on its return, the sight would be very cheering to the people of the Capital. Their dogged endurance has aroused the admiration of the whole world, and their phlegmatic "We can take it" has become a by-word. They, if any, deserve the joy of seeing that "We can give it."

Moscow Raided

THE German invasion of Russia had been in progress for several weeks before any report was made of heavy raids by the *Luftwaffe* on important Russian cities. The first night raid on the Soviet capital was made on July 19 and does not appear to have been a brilliant success. The German accounts may, of course, be discounted. The Russian version receives substantial confirmation from Reuter's special correspondent, whose word will be accepted. He agrees that of the 200 bombers which the Germans say that they despatched many did not reach the city, and places the raid in the category of what would be called by London a "medium blitz." The civil defence services, he said, worked well, which is gratifying, as experience in the West has been that it is often practice which brings something like perfection to wardens and fire-fighters.

This contrast between the behaviour of the *Luftwaffe* in Russia and its behaviour in other invaded countries is striking. Elsewhere the German bombers have lost no time in trying to strike, sometimes at military objectives but more often at civilian *moral*. In Russia, it is said

that the Germans expected that dissatisfaction with the Soviet regime would quickly be manifested, which would naturally seem to them a good reason for striking at the civilians without loss of time. Some consideration has delayed them, and one can only speculate upon the cause. Wishful thinking is a thing to be avoided, but one possibility is that the bombing strength of the Germans is no longer what it was last autumn. The great loss of the best of their air crews in the Battle of Britain must have had its effect, and it certainly seems that the Russians have taken a heavy toll of their enemy's aircraft. With possibly reduced resources, the German airmen have been kept very busy on the battle fronts, trying to use the air arm to break up the resistance of the Russian armies, and particularly to hamper their power of manœuvre. It may be that Göring had not the margin of bomber strength needed for immediate attacks on cities. Once he had made a start, he naturally continued the raiding, but it is the delay in starting which is most striking.

If it is correct that 200 German bombers set out for Moscow on the first raid, and that a large proportion of the force turned back without reaching the objective, one may deduce either shortcomings in the matter of navigation or a lack of aggressive spirit. Certainly, last autumn the German airman showed no lack of fighting spirit or of willingness to suffer heavy losses. The Battle of Britain in its later stages must have been a terrible ordeal for them, yet they never hesitated to come on. If it is true that they now show less resolution, it is a cheering phenomenon—but the full facts are not yet known in this country

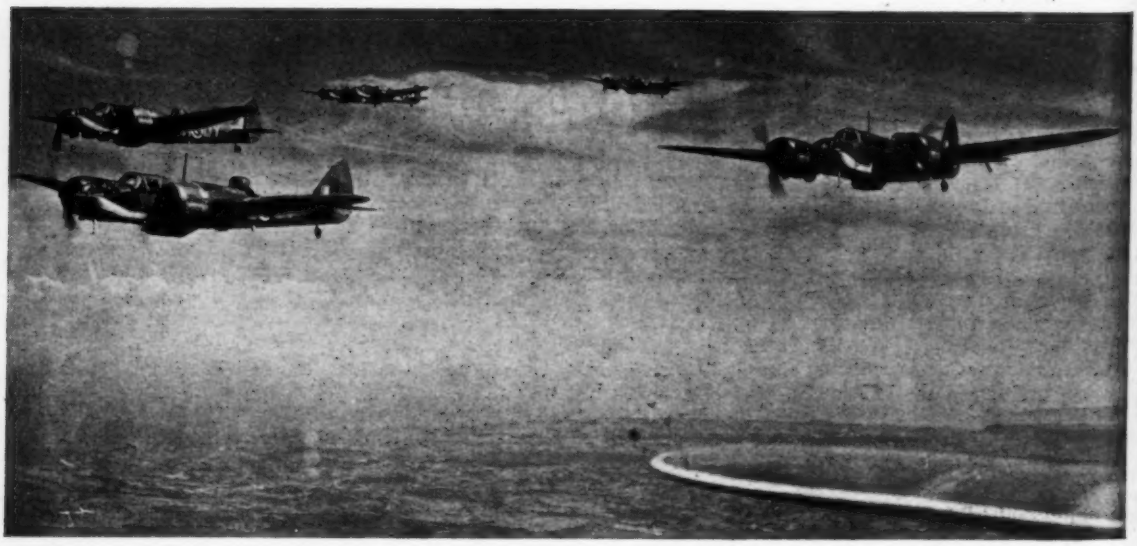
Many Types

THE multiplicity of aircraft types opposed to the enemy is very great, much greater than the number of German types. Against the two German fighters, the Me 109 and Me 110, we have the Spitfire, Hurricane, fighter Blenheim, Defiant, Beaufighter, Havoc, Tomahawk and Mohawk—with others to come. For other types the situation is comparable. The Germans drastically restricted their number of types and "froze" designs in order to swell their production figures. If the right type is "frozen," this may be a very successful move—but it is also very risky, and the Me 109, for instance, proved not to be the right type. Even the latest version, the Me 109 F 1/2, with its modern improvements, is a poor thing in comparison with our Typhoon, or even with the later marks of Hurricane and Spitfire.

The original Me 109 was not designed for an engine of 1,150 h.p., but for one of much lower power. It was undoubtedly "frozen" too early. From the description given in this issue it is evident that its chief deficiency lies in lack of fire power, even though it has a most remarkable Mauser shell gun with a very high rate of fire. The motor is the improved DB 601N, but an exact comparison of this with the latest Merlins of our fighters cannot be made as these engines are still secret.

Our great variety is due to two facts. First, we have always believed in having two designs for most of our types, the Spitfire and the Hurricane, both designed to the same specification, being the classic example of this. This practice is an insurance against failure of a design when put into operation, an insurance which was not needed in the foregoing example. The second reason for having many types is not intentional. This is the very welcome addition to our strength of all the Americans. We first took over all the uncompleted French orders and then signed large contracts of our own. Now we are able to order by means of the book entries of Lease and Lend accountancy. With the large number of firms which there are in the States there must necessarily be a large number of types until the Office of Production Management and our own British Air Commission "rationalise" them. This has already been done for the four-engined bomber types and several of the large firms are pooling resources to make only two designs, the Fortress and the Liberator.

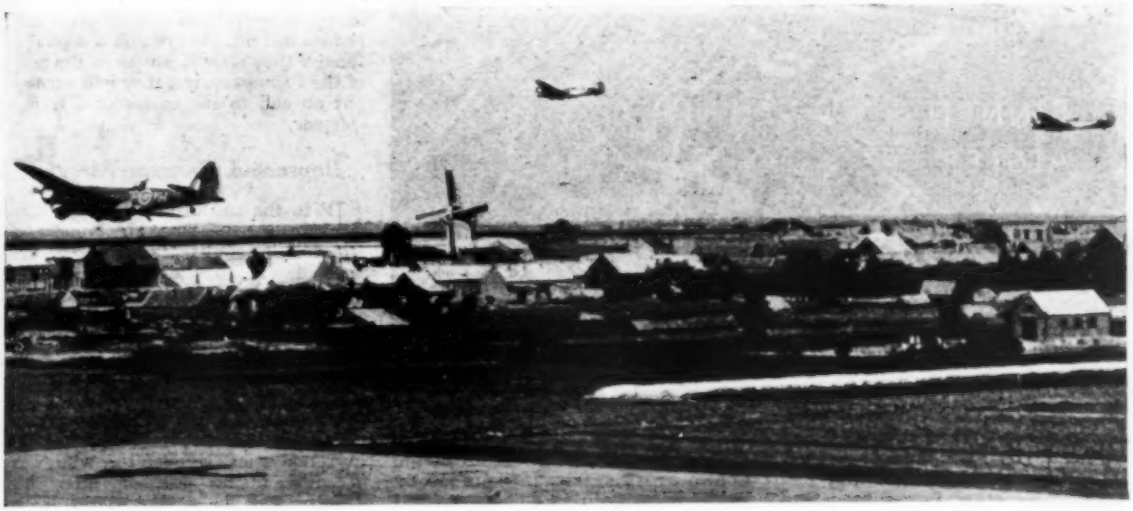
The former will be made by Boeing, Douglas, and the Lockheed subsidiary, Vega, while the Liberator will be built by Consolidated and Douglas at Government-owned factories in the southern states, with Ford supplying parts.



CONVOY PROTECTORS: Bristol Blenheim Mk. IV. F. fighters in formation. They are used extensively on convoy patrol work.

War in the Air

Japan's Southward Move : Heaviest Raids on German Warships : The Stirling, Fortress and Halifax Engaged in Daylight



GIVING THEM THE LOW-DOWN : Bomber Command Blenheims flying over Holland during their attack on German shipping at Rotterdam. It is estimated that on this raid alone 100,000 tons of shipping were put out of action.

AT last, after several weeks of fighting, the Germans in the third week of July began to bomb Moscow by night. They made no attempt to do so by day, despite their one-time theory that only daylight bombing could give useful military results. That theory cannot be put into practice unless the aggressor has fairly complete command of the air, and the fact that the Germans did not attempt it shows that the Russian fighters are still a force which exercises a great influence on the course of the campaign. It has forced the *Luftwaffe* into a course of action in which its chiefs have openly said that they have no real faith. The night raids, at first at any rate, were far from being brilliant successes.

THEIR EXITS AND THEIR ENTRANCES : A front gunner-bomb-aimer deplanes from his Douglas Havoc long-range fighter-bomber.

As a contrast to this rather inept German performance, there is the continued harassing of military targets in Northern France by the R.A.F. in broad daylight. The following summary of its operations over one month has been officially compiled.

Spitfire and Hurricane pilots of Fighter Command flew more than 2,000,000 miles on successful fighter-bomber offensive from June 14 to July 14. They destroyed 301 Me.109s, including many of the new 109F type, probably destroyed many others whose fate they were not able to confirm, and damaged many more. These victories, won over enemy country where an oil leak may mean that the pilot has to bale out, were achieved for the loss of 118 of our fighters, 17 of the pilots being saved. Many other pilots were seen to land by parachute in France. In addition to our fighters' victories, the bombers themselves have shot down four Me.109s and damaged others.

These R.A.F. offensives have achieved important results. Factories and power plants working for Germany's war machine in France have been destroyed by the escorted bombers.

In the 31 days under review 36 offensive raids were carried out, the most effective active period being over the week-end when the Germans invaded Russia. In five operations then 75 enemy fighters were destroyed and many others probably destroyed or damaged. Our losses were eight fighters.

Some of the results of bombing on these escorted operations show that the chemical works and power plants at Chocques no longer appear to be active ; the steel works at Fives, Lille, are badly battered ; two gas holders with a capacity of 25,000 cubic metres have been destroyed at Mazingarde ; the power plant at Pont-a-Vendin has been put out of action ; and many other factories and plants damaged.

Japan and Indo-China

AN unwelcome, but not altogether unexpected, development has been the demand of the newly formed Japanese Cabinet for naval and air bases in Indo-China, and the consent given by the Vichy Government. The usual Axis excuse was made that the move was intended to forestall seizure of the country by Britain and China, and in excusing its acquiescence the Vichy spokesmen made a rather smart debating point by alluding to Syria, as

ARE OUR BOMB-AIMERS ACCURATE? (1) **The Binnen Alster area of Hamburg before the building of a camouflage Lombardsbruecke Bridge 600 yards north of the original bridge.**

a part of the French Empire which they had not been able to defend, saying that in consequence they had to ask some other Power to defend Indo-China for them. The argument was smart, but quite unconvincing. Japan obviously wants to have bases from which she can threaten the Burma road into China, and also Malaya and the Dutch East Indies. Neither of the latter territories are ripe plums ready to fall into the Japanese maw. The air strength of Malaya has recently been considerably strengthened, and the Japanese air arm, even if locally superior in numbers, is in quality far below the standard of the R.A.F. and the R.A.A.F., both of which Forces are represented at Singapore, and in the surrounding country. Standing at the ready is not a favourite occupation of either Home or Australian airmen, and they have probably been (in R.A.F. parlance) badly browned off while waiting there. There is nothing they would so enjoy as to be attacked and to be able to let fly with their machine guns at an invader. The higher authorities are not likely to share this desire, and we most of us hope that the world war will not spread to that part. The United States also holds strong views about rights in that part of the world, and it is known that American statesmen have been saying some very straight things to the representatives of Japan.

Enemy Shipping Attacked

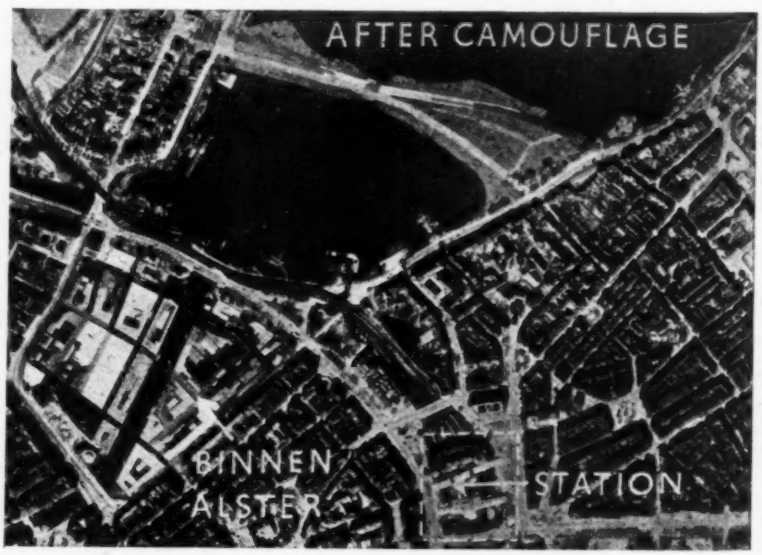
IN addition to the daylight sweeps over France and the heavy night bombing of targets in Germany, the R.A.F., assisted at times by the Fleet Air Arm, has lately been making a heavy onslaught on the enemy shipping moving along the shores of the Continent. The ships used are mostly small, from 2,000 to 5,000 tons, and so many of them have been on the move lately that it is clear that a great effort is being made to relieve the constant strain on the internal communications, including canals, used by the German forces and civil administration. Great numbers of these coasting vessels have recently fallen victims to British bombers of the Bomber and Coastal Commands. They are usually escorted by *flak* ships, so the British airmen have to run risks in attacking them. These risks are cheerfully accepted, and on not a few occasions the *flak*-ships themselves have suffered for their interference. The torpedoes carried by Beauforts are particularly deadly in these operations. Air-borne torpedoes will not always sink a warship, though they slow it up (as in the case of the *Bismarck*), but they will usually put an end to the career of a tramp steamer.

Depressed German Airmen

UP to the end of the third week in July the German air attacks on Great Britain were far from wholehearted, and showed that the serious attention of the *Luftwaffe* is directed eastward. It must be rather depressing for the crews of the German machines left in France to be ordered to take off on a mission in which they must know that their High Command is not much interested. Depression seems to have taken possession of some of the men, and one wireless operator who was recently taken prisoner after his bomber had been shot down by a night-fighter confessed as much.

"I always knew that there were no laurels to be won in England," he said, "few of the flying personnel escape; they either get shot down or taken prisoner. Before we started on this trip I had a presentiment that it would be unlucky. The pilot was very nervous and said that the whole flight was a farce. That was why he was so worked up. From the start

ARE OUR BOMB-AIMERS ACCURATE? (2) **The Binnen Alster area of Hamburg after colossal camouflage work had been completed. If, as the Germans declare, our bombing is indiscriminate and of no account, why take all this trouble to move the apparent position of the target such a short distance?**



WAR IN THE AIR

everything went wrong. After taking off he took half an hour to get the wireless frequency tuned.

"We were flying at about 19,000 feet," he said, describing the flight. "I looked out and saw a shadow behind us and to the right, and thought to myself, 'I mustn't make a mistake—you don't want to tell the others it's a night-fighter when it may not be one.' I took another look and then saw that he was still behind us and about 650 yards away. I switched on the intercommunication and shouted, 'Night-fighter astern and to starboard,' and I told the pilot he ought to turn off to the right and then perhaps the fighter would miss us as we turned into the darkness.

"The moon was as bright as day, high up in the sky. The pilot did not turn off and the night-fighter came closer and closer. It only gave us a few seconds, then there was a bang and crash in the aircraft and bits flew all over the place. The mechanic shouted out, 'I'm bleeding to death,' or something like that. I had not time to attend to him—things moved too fast. He probably caught the whole dose but it didn't touch me, probably because of the armoured plating. I still had everything on, oxygen mask and all the trappings. I looked out again for the night-fighter and saw him banking away. I swung the machine gun round and sent a burst after him. Then the Lieutenant said, 'Don't fire,' and I looked out and saw flames coming from beneath the port engine. At that I hurried. As soon as the burst hit our aircraft the pilot had put the nose down, and probably got rid of the bombs. Then he simply roared down so that I had no idea how high we were. I usually had my parachute hanging up inside because I knew that in a Heinkel 111, by the time you get forward, it's a devil of a job to get out. In the Ju 88 it is easier. On that evening we had taken over a brand-new aircraft with brand-new parachutes and mine didn't fit. But I struggled into it and opened the lower escape hatch—and jumped."

BRITISH AIR LOSSES TO JULY 26th.

	Over G.B. Fighters	Over G.B. Pilots	Over Continent Aircraft	Middle East Aircraft
July 20	—	—	2	—
,, 21	1	1	8	3
,, 22	—	—	3	—
,, 23	—	—	15	—
			(1 pilot safe)	
,, 24	—	—	27	—
,, 25	—	—	9	—
,, 26	—	—	—	—
	—	—	—	—
	1	1	64	3
	—	—	—	—

Totals: Northern Area, 2,361 · Middle East, about 344.

The Great Daylight Raid

ONE would very much like to know how the *Scharnhorst* contrived to get out of Brest harbour. Was it under her own power or in tow? The repair workers must have been quite clever in enabling her to get away after all the attention she had received from the Bomber Command, and all the enemy parties concerned must have been mightily relieved to see her go. It was a fairly long trip down to La Pallice off La Rochelle, some 240 miles. Some clever camouflage work was attempted to make the R.A.F. believe that she was still in Brest under a net, but the R.A.F. was not deceived. It was not long before the reconnoitring machines had spotted her in her new berth, and then the Bomber Command took fresh action.

First a formation of Stirlings went at her by daylight, fighting their own way in and shooting down a couple of Me 109s—for La Pallice is outside the range of Hurricanes and Spitfires. Night attacks by other bombers followed, and on the next day there were more daylight attacks by Halifax bombers. At the same time other formations of bombers with fighter escorts kept hammering away at Brest, where the *Gneisenau* was still in dry dock and the *Prinz Eugen* was also moored. Boeing Fortresses led this attack, flying at a great height, while Hampdens worked from a lower level. The British fighters engaged the Messerschmitts which rose to meet them. It was the largest scale daylight raid undertaken by the R.A.F., and the timing and staff work was of the highest order. Hits on both the *Scharnhorst* and the *Gneisenau* have been confidently claimed.

The losses in aircraft on both sides were considerable, but this action was part of the Battle of the Atlantic, the most critical battle in which Britain is now engaged. The men of the R.A.F. do not hesitate to run risks and incur losses in that battle, even as the equally gallant sailors of the Merchant Navy are doing every day. The R.A.F. is determined that, so far as in them lies, those three German warships shall not again get loose in the Atlantic to sink the ships which bring cargoes from America to the British Isles.

Aircraft played a conspicuous part in another air-sea battle, when Admiral Somerville, leading a naval escort which included H.M.S. *Renown* and *Ark Royal*, led a convoy of ships with troops and stores on board through the Mediterranean to its destination. The enemy attacked furiously with U-boats, surface craft, high-lever bombers, dive-bombers, and torpedo-carrying aircraft. The fight lasted for two days, and in the course of it the destroyer H.M.S. *Fearless* was hit, and had to be sunk by our own forces. One of the merchant ships was also hit, but was able to steam on under her own power. One of our cruisers and another destroyer was damaged. The fighters from the *Ark Royal* fought magnificently, and took heavy toll of the attackers. The Fleet Air Arm added to its high reputation, and did so with only slight loss to its own numbers. At least 12 enemy aircraft were shot down, and probably others were also destroyed, for a loss of three of our naval aircraft, the crew of one being saved. The bringing of the convoy safely through was a magnificent piece of work, and shows that the Royal Navy is not to be stopped by anything which the enemy can bring against it.

E Boats at Malta

THE Axis also made a wild attempt on Malta harbour with E boats and a new type of small torpedo-carrying boats, of which the Italians were very proud. Enemy aircraft flew overhead, but failed to give air protection to the sea flotilla. The fixed harbour defences blew the boats to pieces, and not one got through. Some R.A.F. fighters engaged the enemy air escort, while others pursued the flying E boats and shot more of them to destruction.

After many quiet weeks, the *Luftwaffe* began to raid London once more on the night of July 27-28.

ENEMY AIR LOSSES TO JULY 26th.

	Over G.B.	Over Continent	Middle East
July 20	—	2	—
,, 21	1	9	—
,, 22	—	4	—
,, 23	2	13	—
,, 24	2	35	—
,, 25	—	—	—
,, 26	—	1	5
	—	—	—
	5	64	5
	—	—	—

Totals: Northern Area, 5,151; Middle East, over 1,975.

Motorboat Crews Wanted

THE R.A.F. is in immediate need of more personnel to man the high-speed launches of their Sea Rescue Service—a need which has been created by Britain's increasing air offensive.

Men between the ages of 18 and 42 are asked to volunteer for this branch of the R.A.F., and there will be a natural preference for those with experience.

New "Shadow" Chairman

IT has been announced by the Minister of Aircraft Production, Col. C. T. Moore-Brabazon, that Capt. J. P. Black has been appointed chairman of the Joint Aero-engine Shadow Committee of the M.A.P. in succession to Mr. W. E. Rootes. Capt. Black is managing director of a well-known firm of motor car manufacturers in the Midlands.

Speed of the Lightning

THE Lockheed P-38 Lightning was flown in U.S.A. in its first public demonstration on May 6th by the Lockheed test pilot, Milo Burcham. According to the Aeronautical Review Section of the *Journal of Aeronautical Sciences*, it attained a speed of 458 m.p.h. on this occasion. It is not clear whether this was in level flight.

THE ME 109 F1/2

Little Progress Shown in Latest Model

GERMANY'S latest version of the Messerschmitt 109, the Me 109 F1/2, though only brought down on July 10th, has already been examined by the technicians of the Ministry of Aircraft Production and made available for inspection. As a fighting machine it does not impress, and it is difficult to understand the German mentality which, in modifying its front-line fighter, reduced fire-power below that of the Me 109s which were routed from the battle sky of 1940. For one of the outstanding changes is that, instead of having four machine guns or two machine guns and two shell guns, this fighter has two rifle-calibre machine guns (7.92 mm.) and only one shell-gun. This fires through the airscrew hub, but the machine guns are mounted on top of the engine and so handicap their rate of fire by firing through the airscrew.

The shell-gun is, however, very efficient, being a 20-mm. Mauser with a rate of fire of about 900 per minute, whereas the 20-mm. Oerlikon fires at about 550 per minute.

New Petrol Tank

Shells have been increased from 120 to 200 rounds. The gun is belt-fed from the starboard wing and is electrically cocked and fired. The amount of 7.92-mm. ammunition has been halved, from 2,000 to 1,000 rounds, it is believed.

The armour plate attached to the hood behind the pilot's head remains unchanged, but the fuselage bulkhead which was previously behind the petrol tank has been moved to a position between the tank and the pilot. This tank, which is immediately behind and under the pilot's seat, now consists of a flexible bag enclosed in and supported by a plywood box.

The quality of the fuel has been raised to 95 octane by the use of a high (40 per cent.) aromatic mixture. An increase in compression ratio of the engine from 6.9 to 7.9 has been made by changing from concave to flat-topped pistons. This change, with an increase in revolutions from 2,400 r.p.m. for one minute to 2,600 r.p.m. for three, has raised take-off power from 1,050 to 1,150 h.p. Boost pressure has been raised to 1.42 kgm./sq. cm. Though this machine has not been flown since capture, its ceiling is believed to be 41,000ft. Whether it can be used at 41,000ft. is another matter, for no pressure suit has been provided for the pilot and all available information on the physiology of flight indicates that not even neat oxygen is satisfactory at such a height. Certainly a new type of high-pressure oxygen equipment has been fitted.

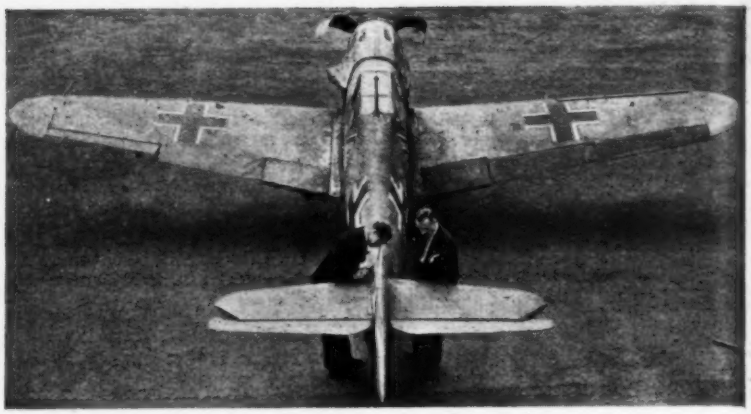
The tailplane has been altered to a cantilever type, but is still adjustable, a feature which has long been discarded in British design. The tail wheel has been made retractable. The wing area and span remain the same, but the tips have been rounded. Wing loading is now 32 lb./sq. ft. The proportions of flaps, ailerons and slots have been altered, and the slots no longer have parallel motion mechanism.

Radiator Design

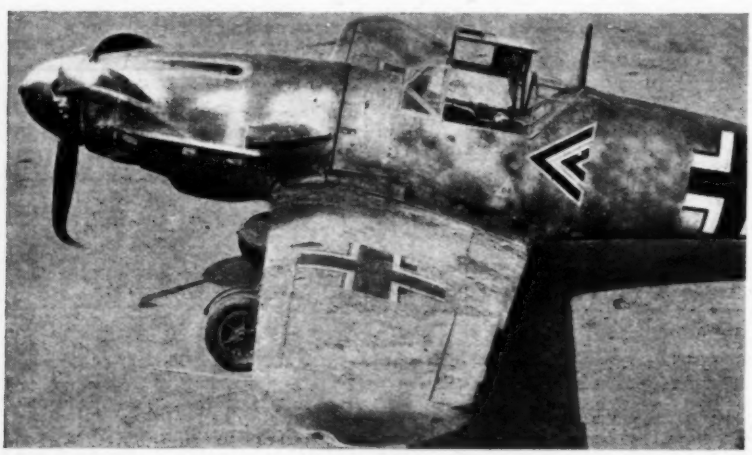
The most ingenious feature is the design of radiator. There is one under each wing, and they are sunk deeply into the wing. Flow is controlled by two hydraulically operated exit flaps. At the entrance to the radiator the turbulent boundary layer from the underside of the wing is collected by a small lip into a by-pass duct, led past the radiator and discharged at the trailing edge. Thus, all the air entering the radiator is in laminar flow, so reducing cooling drag.

The coolant tank has been removed from the front of the engine and replaced by two smaller tanks, one on each side of the engine crankcase. Occupying the former position of the coolant tank in front of the engine is the oil tank. The airscrew spinner is increased in size. The airscrew was previously an infinitely variable pitch type with manual operation and not constant-speed. Though it still does not have this desirable feature, it has been improved by the addition of a governor which, for any particular throttle setting, limits the airscrew speed and so prevents over-revving.

Blind flying instruments have now been mounted on a sprung panel, and a master compass has been mounted in the rear of the fuselage with a repeating dial on the dashboard. The windscreen is not bullet-proof, being only ¼in. thick.



THE MESSERSCHMITT ME 109 F1/2. Armament consists only of two machine guns and one 20-mm. Mauser shell-gun. Speed remains about the same at 360 m.p.h. Note the air intake on the port side, and the two-piece flaps.



Though take-off power has been increased from 1,050 to 1,150 h.p., this Me 109 is not, even yet, a good fighter. The windscreen is not bullet-proof and the tyres appear small enough to sink in readily on a soft aerodrome.

SPOTTING BY NIGHT

Outlines and Silhouettes of Aircraft as Seen in Searchlight Beam.

DESPITE the application of radiolocation the military searchlight is still a very necesssary part of our equipment. This article, specially written for "Flight" by Major L. E. C. M. Perowne, R.E., the recognised authority on the training of searchlight spotters, consists largely of extracts from his book, "The Training of the A.A. Searchlight Spotter," which may be obtained from the Institution of Royal Engineers, Chatham.

EXCEPT in a few occupations, belonging principally to countrymen, the functions of the anti-aircraft spotter find no counterpart in civil life, while telescopic vision—one of the most difficult arts to acquire, demanding long periods of constant practice to achieve perfection—is commonly practised by few among those from whom potential spotters are drawn.

The training of spotters is, moreover, rendered the more difficult in that, by the very nature of the processes involved, there is no opportunity for demonstration and the degree of perfection obtained must remain for ever known only to the pupil himself. It is, perhaps, this very intangibility which so often creates the impression that the spotter's rôle has little or nothing to it.

The precise location of an aircraft, even in broad daylight, is not always easy to the untrained, but by making the fullest use of the human faculties of hearing and sight (aided by certain instruments and by natural indication of its whereabouts manifested by the target itself, or by the behaviour of guns or searchlights engaging it) the spotter can obtain results under conditions which might be thought impossible.

The first indication of the presence of hostile aircraft will often be the flashes of guns or shell-bursts. By night, searchlight activity will repay study and occasions are not infrequent when a target, though itself in darkness, appears momentarily in silhouette before a distant searchlight or in the path of the moon, thus offering to the spotter opportunities for seeing it. The experienced spotter will also find opportunities for detection and location, in favourable meteorological conditions, when the target appears as a black object against a lighter sky, or by observing and tracing to their source the vapour trails left by high-flying aircraft. In the absence of all other aids the acute spotter may locate an aircraft, even though it may be gliding with engines throttled back, by observation of exhaust flashes. Even engineless gliders at low altitudes have been detected from the almost imperceptible sounds they make in rushing through the air.

DIFFICULT EASINESS: The night spotter, in his apparently easy chair, has an exceedingly difficult job. Only a fleeting glance of the target is seen and mental reactions must be immediate.

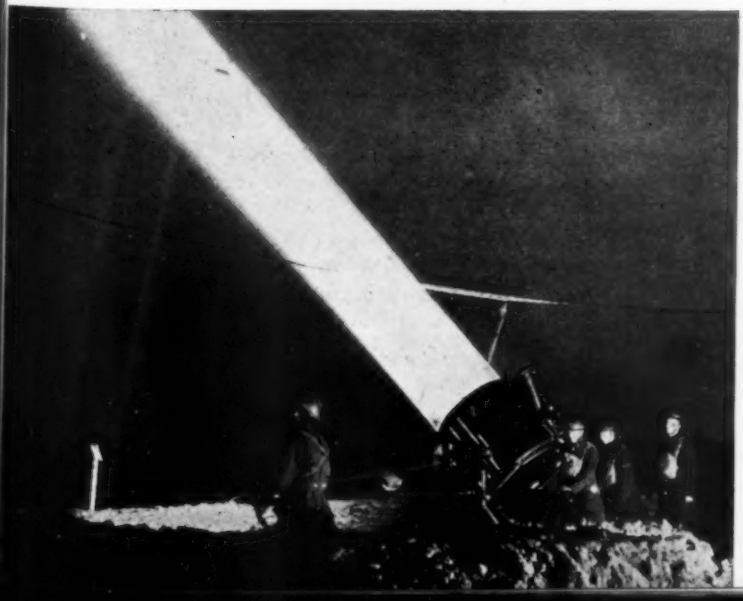
Selection of Spotters

Among the characteristics most required in men selected for spotting duties are keen intelligence, good hearing and eyesight and instant reaction. The ability to command others is also often useful.

The hearing of most men is generally impaired to some extent by accumulations of wax in the ears. A doctor, however, can easily remedy this by syringing. But there are many who, inherently, or by virtue of age or of the nature of their everyday employment, are partially deaf and will never obtain a high standard in the essential distant location of aircraft. In particular, those with any deafness in one ear will be at a grave disadvantage.

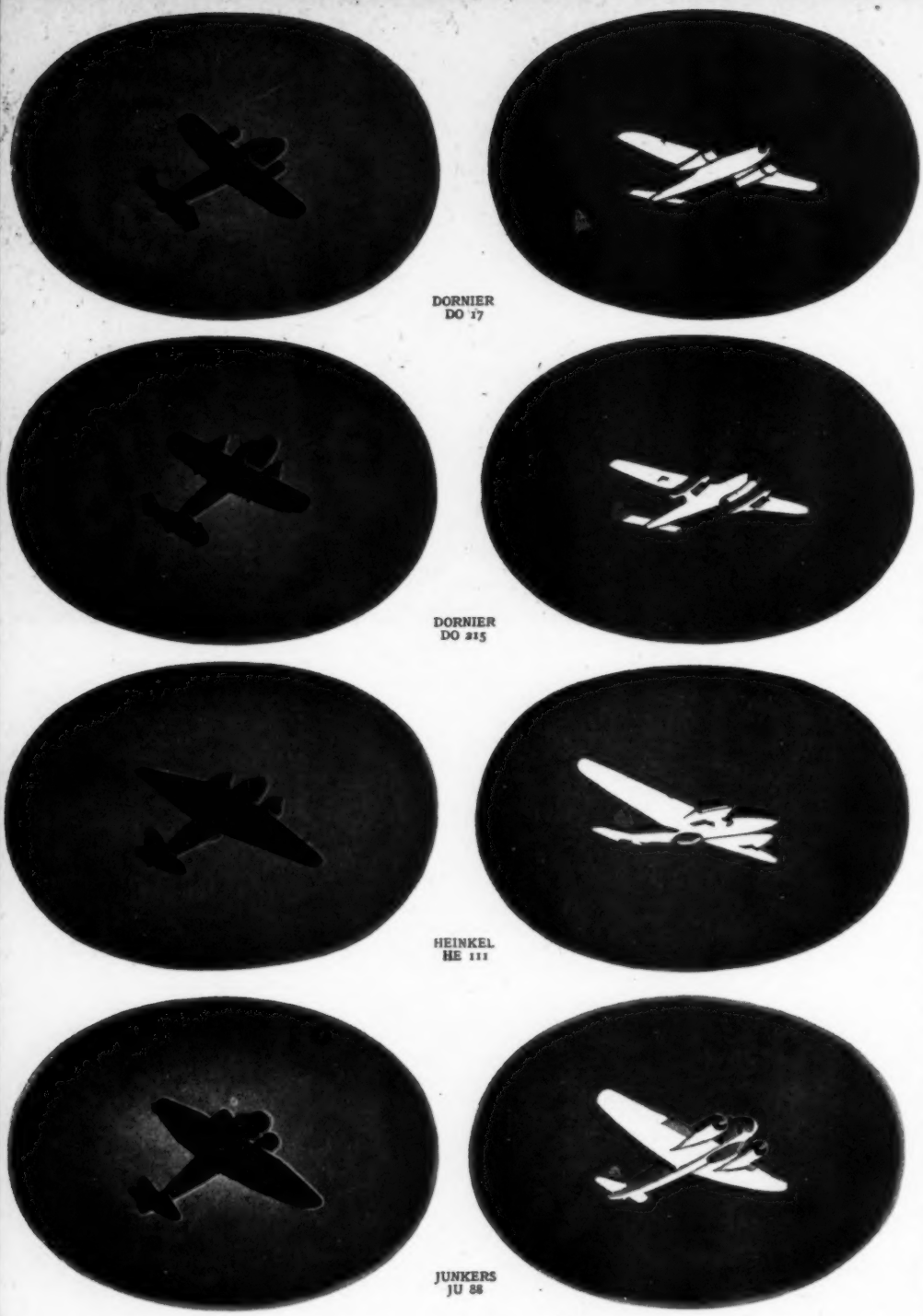
In the modern conditions of working and living in cities many people seldom see anything more distant than 70 yd., with the result that their eyes tend to take up a permanent accommodation for short ranges and they are, therefore, prone to be short-sighted. Among older men long sight is common. Both short and long sight, however, are subject to perfect rectification by the use of suitable glasses, and binoculars can be used effectively by men suffering from these afflictions without the use of their spectacles, the necessary adjustment being made automatically in the process of focusing.

Astigmatism, which arises from the unequal curvature of vertical and horizontal sections of the cornea, may also be rectified, but only by employment of a cylindrical lens. This means that binoculars cannot be employed without the glasses, and men with this affliction of the eye (as well as those suffering from squint) work with binoculars at the disadvantage of a field of view reduced by approximately one-quarter and should not, if it can be avoided, be employed as spotters. Certain eye diseases debar a man absolutely from employment as a spotter.



NIGHTLIGHT: An A.A. searchlight crew of the Royal Engineers in operation.

SPOTTI



ENEMY OUTLINES: The four most widely used German bombers as they would appear to a ground spotter using binoculars and to the pilot of a fighter flying above them.

Of these, one of the worst eye scourges in this country is an oscillating or trembling of the eyes, which is common among miners. Night blindness, or the lack of the power of dark adaptation, is also inherent in a small number of people. Double or even treble vision is present in a few and a man suffering this disability is clearly better not employed as a spotter.

Owing to the speed of aircraft and the frequently fleeting opportunity for detection, instant reaction between ear or eye, brain, and voice or hand are characteristics without which little success can be expected, so that the slow-witted, though his performance can often be improved by careful and prolonged training, can rarely be relied upon as a spotter.

Training the Spotter

The training of the spotter falls naturally into two stages, namely, initial training and exercising.

It should be carried out with the following aims:—

(i) To be able to orient himself by night instantly and to state what point of the compass he is facing.

(ii) To be able to locate a source of sound with the unaided ear.

(iii) To quicken the eye and brain to react instantly to the sight of the target under varying night conditions.

(iv) To learn the care of and efficient use of binoculars.

(v) To develop a high degree of mental alertness.

A more detailed analysis of the spotter's duties may be briefly summed up thus:—

To face the right direction—to locate the source of sound—to predict the actual position of the target within limits—to scrutinise, with binoculars correctly focused, the field of view—to detect the target against the night sky, moon or in searchlight beams, which will involve rapid application of the mental processes of perceiving an object and of appreciating whether or not it is indeed an aircraft—to communicate his discovery to others. Many spotters may also have to direct some instrument to a position in space thus determined.

The process of determining a direction (orientation) by night is not as easy as may be thought. The spotter can assist himself by a knowledge of the stars (e.g., the pole star), or of surrounding objects which stand out even in the dark against the skyline, by placing cardinal point guides around the position where he stands or sits, and by practice with eyes closed by day.

Location and Prediction

The approximate location of the target in space will be determined by the spotter using his ears. The human being instinctively turns and faces the approximate direction of any sound in which he is interested, but if he wishes to locate its source more accurately he must apply the more conscious effort involving what is known as binaural sense (the knowledge that the sound is arriving at both ears with the same intensity). To make himself appreciate the

NIGHT

significance of this, the spotter should face a stationary source of sound, close his eyes and turn his head slowly from one side to the other across the direction of the sound. He should now note the difference in the intensity of the sound in each ear during these movements. All that remains is to speed up the process by moving the head more rapidly, checking the results of his efforts by opening the eyes when he thinks he is facing the source. For this purpose a small buzzer or electric bell from which the gong has been removed will be found useful.

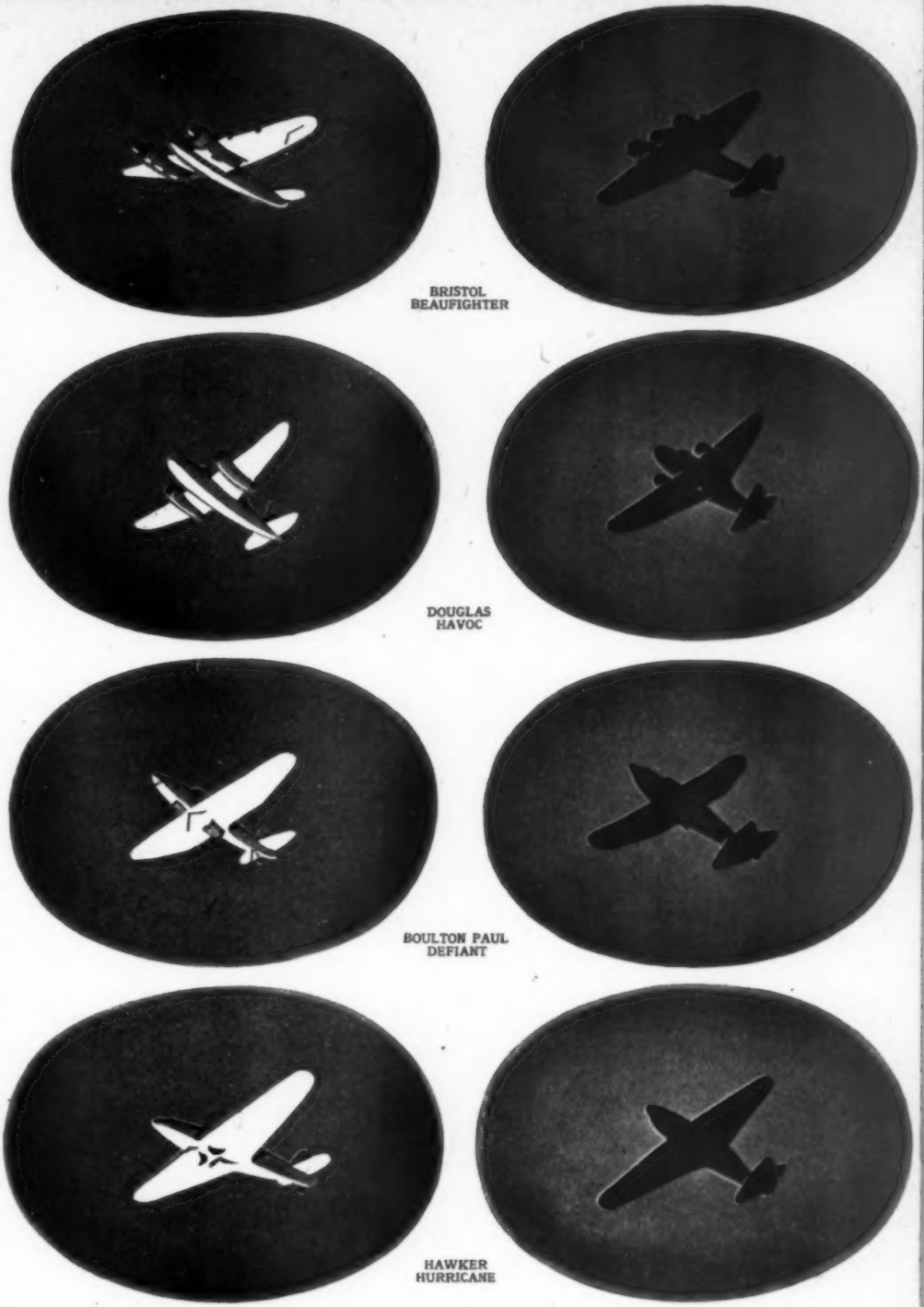
It is now important to allow for the fact that the source of aircraft sound will be moving and that modern machines travel at nearly half the speed of sound. The target will not, therefore, be at the point where it is heard, but at some point farther on. The process of determining where it will be is known as prediction. A simple practice for predicting direction is to stand 10ft. from a source of sound and, having located the direction of the sound accurately by the method described make angular movements in the assumed direction of flight of the target.

The following allowances in bearing will be correct for the speeds given, at any height or distance, for targets crossing directly from left to right or from right to left:—

(a) 100 m.p.h.— 8 deg.
(b) 200 m.p.h.—16 deg.
(c) 250 m.p.h.—20 deg.
(d) 300 m.p.h.—24 deg.

As an approximate guide, a deviation of 1in. at 10ft. equals ½ deg.

Estimation of target speed and course comes only with constant practice on targets flying on different courses. The foregoing exercise serves only as a guide to the order of magnitude of the angular aim-off necessary to compensate for sound lag. The aim-off so estimated is based on the assumption that the target continues at constant speed, height and course. It is thus important that the process of location and prediction by sound be carried out quickly, so that there is the shortest possible time for the enemy to vary these assumed constants.



FRIENDLY OUTLINES: R.A.F. night fighters as seen from above and below in a searchlight beam.

Errors in location by sound unaided by instruments can be less than 5 deg. in bearing, but may be as much as 30 deg. in elevation owing to the lateral positioning of the ears. It follows that, having determined the bearing of a sound, it is necessary to carry out a visual search to cover the elevation error. This search is best done upwards for an approaching target and downwards for a receding target, and should cover the arc of sky 30 deg. above and below the estimated position of the target.

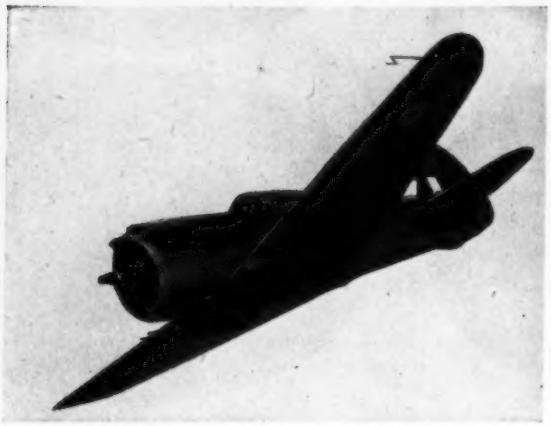
By these processes we are enabled to *locate* the whereabouts of the target. This location by itself is useless if the man fails then to detect the target, i.e., if he then fails to *see* it. In practice this process of detection is exceedingly difficult and, if we are to train men in it, we must first have some idea of what it consists.

(To be continued.)

Thirtieth of the Series

FRIEND or FOE?

Two More American Fighters : Curtiss Mohawk and Vultee Vanguard



CURTISS MOHAWK : Low-wing, tapers on trailing-edge, dihedral from roots. Radial engine, no spinner. Deep oval section fuselage. Undercarriage retracts backwards with fairings for the legs. Tapered tailplane with curved elevators is set at base of fin ; rudder has curved trailing-edge.

VULTEE VANGUARD : Low-wing, tapers on both edges to rounded tips ; dihedral from roots. Radial engine, no spinner. Fuselage of very similar proportions to the Mohawk but tailplane and fin and rudder have straight taper on both edges, the latter having small, round apex.

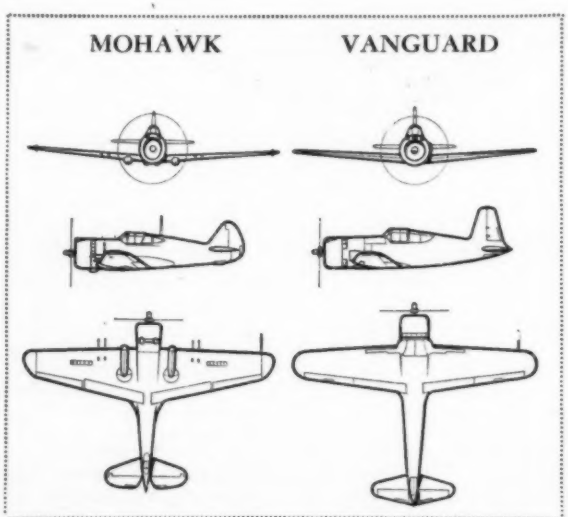
CURTISS Mohawks have already been delivered in fair numbers to the R.A.F., but the Vultee Vanguards have still to make their bow on this side of the Atlantic. These two machines resemble each other very closely in general appearance and are almost exactly the same size, but there is a difference in wing-plan which will distinguish them when more or less directly overhead, and an even sharper difference in the shape of their respective fins and rudders which furnish an easy point for discrimination when a side view is obtained. From a head-on view, however, about the surest way of recognising these two machines apart is provided by the leg fairings which can be seen below the wings of the Mohawk, the undercarriage of which retracts backwards from beneath the leading-edge. The Vanguard undercarriage retracts inwards and leaves no protuberance beneath its wings. To enable the wheels of the Mohawk to stow away in recesses in the wings, they rotate through 90 degrees as retraction takes place. The wings have a straight leading-edge but a generous taper on the trailing-edge which has fillets at the roots and which curves forward into the leading-edge at the tips. The long chord cowling of the radial engine has controllable gills at the back, while the business ends of a pair of its guns give the appearance of two protruding eyes on top. The cockpit cover has a well-raked front and is faired smoothly off into the "after-deck" of the deep section, oval fuselage, in which it differs hardly at all from the Vanguard. The fin and rudder, however, are very different, having a straight slope to the leading-edge and a rounded apex, the curve of which continues smoothly down the trailing-edge to blend into the bottom line of the fuselage tail. The tailplane, with a straight taper to the leading-edge and a curved trailing-edge to the elevators, is set level with the base of the fin.

The plan view of the Vanguard's wings show a slight taper to the leading-edge, a rather more pronounced one to the trailing-edge and evenly rounded tips. The cowled radial engine and the fuselage are, as already indicated, almost identical in appearance with those of the Mohawk, such small differences as exist being only apparent when the two aircraft can be compared side by side and in similar attitudes as depicted.

The tail of the fuselage, however, projects beyond the base of the rudder which sits upon it and, with the fin, makes an inverted "V" with a rounded apex.

The plan of the Vanguard's tailplane is perfectly symmetrical ; both edges taper equally to small rounded tips and the trailing-edges of the elevators line up with the extremity of the fuselage, the tailplane being set practically on the thrust-line.

If you study carefully the pictures above it will also be noticed that the wings of the Vanguard are set a shade farther back from the nose, that the cowling lacks the protruding "eyes" of the Mohawk and that it has larger cooling gills, the Vanguard being equipped with a Pratt and Whitney Twin Wasp engine, whereas the Mohawk has the Wright Cyclone power unit. Reference to the general arrangement drawings will make clear at a glance the various points of difference observable from the three different angles. These may be summed up briefly as follows: Head-on view, leg fairings ; side view, fin and rudder ; plan view, wings. Note, also, the projecting guns on the wings of the Mohawk.



Next week: Vought Sikorsky Chesapeake and Northrop A 17-A.

WALRUS RETURNS

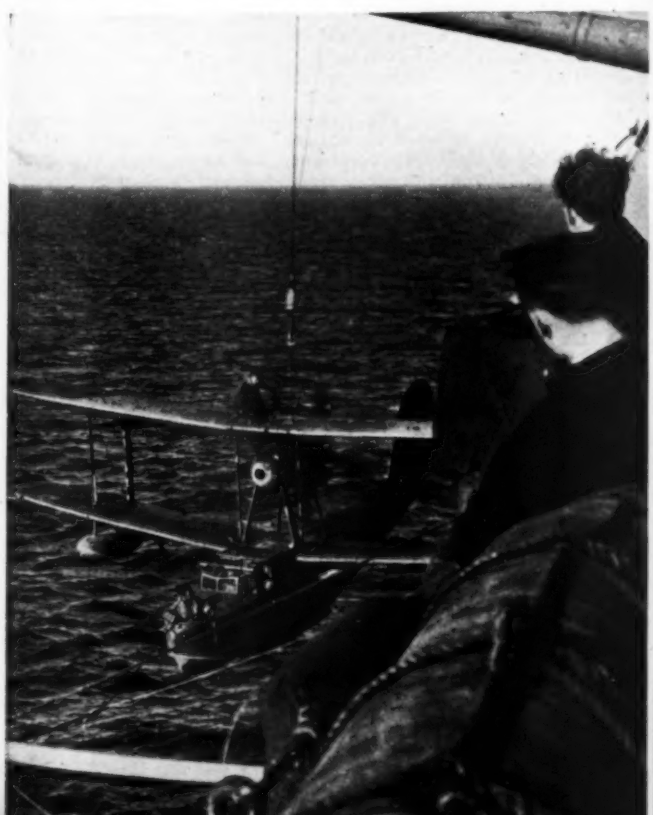
Pictures from Northern Waters

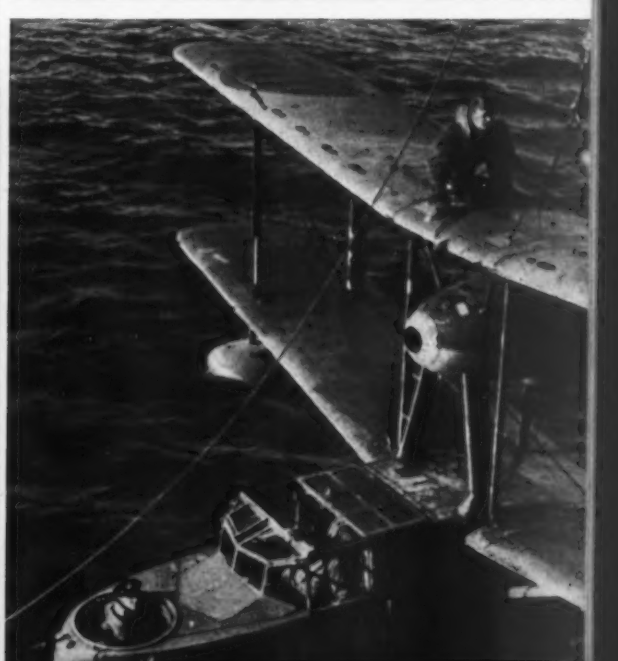
IN these pictures, exclusive to *Flight*, is shown how a Vickers Walrus is picked up and stowed aboard after a reconnaissance flight. The ship is H.M.S. *Suffolk*, a 10,000-ton cruiser of the County type, carrying 8in. guns as its main armament. According to Brassey, three aircraft are carried in hangars amidships, but wartime complements may vary considerably from peacetime establishments.

The top photograph shows the "slick" made by turning the ship to provide smooth water for the aircraft to alight. In the background can be seen large icefloes, which are a continual menace to flying-boat hulls in northern waters. On the ship it will be noticed that the hoisting crane is still inboard. Multiple pom-poms, or "Chicago Pianos," as they are called, are kept at the "ready" for any Kurier or Condor which may put in an appearance. The next picture shows the Walrus taxying in after alighting, and also shows how the secondary armament of the ship is of the dual-purpose, twin-turreted type. As the aircraft approaches the ship one of the air crew climbs on to the top plane to make ready the hoisting tackle, while another goes into the front gunner's cockpit ready to take the steadying wire from the lower boom and make it fast to a mooring bollard. The photograph in the bottom right-hand corner shows the hoisting and steadying tackle hooked on. A point of interest is the footprints painted on the top plane. These indicate a walk way for riggers. Ladders cannot be used at sea!

In the final photograph below, the Walrus is out of the water. Apparently no submarines have been spotted on this trip, for the bombs are still in their racks under the wings.

The whole process of alighting and hoisting out of the water appears to be quite simple. If it is made in a fairly rough sea, however, the man on the top plane has an unenviable task.





BETTER U.S. BOATS and BOMBERS

Britain is Reaping the Benefit of American Developments : Some of the Latest "Lease and Lend" Types Reviewed

By J. L. WADDINGTON

EVER since the days of the Douglas D.C.1 and D.C.2, the United States have been trying to produce "Bigger and Better Aeroplanes," but in the summer of 1939, just before war was declared, the size of the Douglas D.C.4 provoked a lot of comment and discussion, and opinion was divided on the advisability of producing so-called giant civil aircraft. Many people considered that from the operational point of view, a lot of capital was being locked away in one machine, particularly as they maintained that two D.C.3s would carry more and cost less to operate than one D.C.4. They did admit, however, that the latter had one definite advantage—the ability to carry its load non-stop from coast to coast.

Maybe the opponents of the large aircraft were quite justified in their views, but the development of this type must be considered a great advantage to United States constructors—and so to us, as customers—in the experience it gave them in the production of large bombing aircraft.

There is also no doubt that the United States designers led the world in large civil aircraft, and in this way we may be very thankful, for we are now reaping the benefit of their experience in the shape of Flying Fortresses Liberators, and even larger types yet to come.

Again, in the large aircraft, the air-cooled engine comes into its own and so gives the American bomber the advantage of engines on which the American engine manufacturers have had long and extremely satisfactory experience. Perhaps the use of liquid-cooled engines of the Merlin-Vulture type might improve the already excellent performance of these types, but an important point to be considered is the relative manufacturing capacity in the United States for liquid-cooled and air-cooled engines. By using the latter in our large bombing aircraft we can utilise the immense capacity of such firms as Pratt and Whitney and Wright, leaving the smaller capacity of Allisons to cater for the fighter aircraft which we are buying.

Armament is Improving

There is, however, the same old criticism still to be levelled at even the recent types of bombers which we are receiving from across the Atlantic—inferior armaments and armour. But we can hope to see this speedily rectified by the present collaboration between our armament experts and American designers, and we shall see the results in the introduction of power-operated turrets, which are already being fitted to certain American types.

The Boeing Company, which first started operations in 1916, is of chief prominence on this side of the Atlantic because of two or its types—the transatlantic "Clipper" and the controversial Flying Fortress. The Clipper has achieved immortality, perpetuating itself in the verb "to clipper." Messages are being sent, for instance, "Please clipper latest news of Syrian invasion." Flying Fortress was obviously a name to stick in the minds of the public and lay Press, but again this question of armament crops up, and although this aeroplane, B.17B, certainly flies according to our standards it is hardly a fortress, as its U.S. armament comprises five single rifle-calibre guns, manually operated and fixed almost arbitrarily in various portions of the ship.

Features of the Fortress

This aeroplane is very good looking, particularly in its Alclad, unadorned by green, brown and black camouflage, and is a mid-wing monoplane powered with four 1,100 h.p. Cyclones G.R.1820 G205As, with interesting exhaust driven blowers. It carries a crew of seven to nine; span 103ft., weight loaded 45,000 lb., with a disposal load of nearly 20,000 lb. Maximum speed 300 miles per hour at 14,000ft. and it has a surface ceiling of 29,000ft., or 25,000ft. on three engines only. Its maximum range is 3,100 miles.

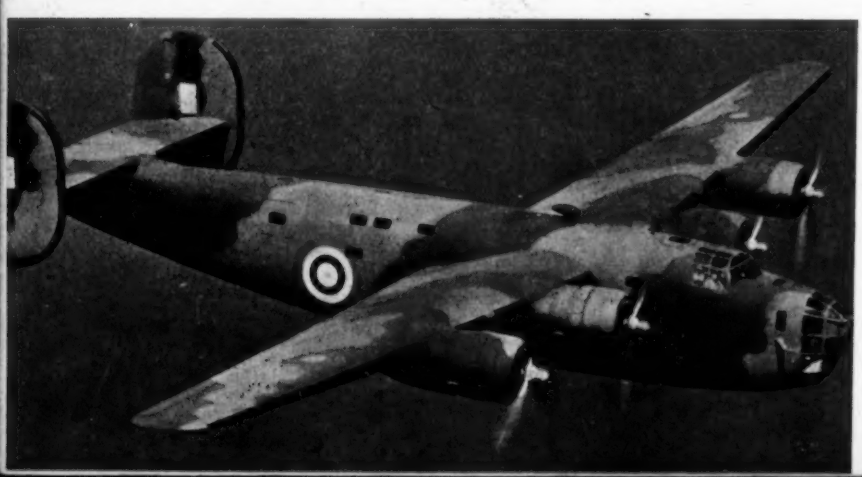
Reverting to armament, an interesting feature of the nose gun is its mounting, which is set in the centre of a transparent plastic moulding without any attachment by structural members.

The latest editions of this aircraft are B.17, C, D, and E, which vary principally in armament improvements, and for the manufacture of which, according to recent information, Boeing, Douglas and Lockheed-Vega are combining their resources. These three concerns should manage to produce quite a large number of this type of aircraft, especially when one considers the record of Boeings on the production side, for as early as 1933 they delivered 60 model 247 Transports to United Air Lines within a space of five months.

Boeings have now been constructing large aircraft for a long time and one can trace the first ancester of the Flying Fortress back to one of the first monoplane bombers put into service by the United States Air Corps in 1931. This Boeing bomber was powered with two 575 h.p. motors, carried a crew of five with a bomb load of 2,400 lb., at a top speed of 186 m.p.h. It had a ceiling of 20,000ft. and tare and gross weights of 8,900 lb. and 14,300 lb. respectively. It was, in fact, quite an advanced and efficient aeroplane, and was even equipped with a retractable undercarriage.

We had to wait until 1934 before the R.A.F. were given the Fairey Hendon monoplane; in the year of the 1931 Boeing bomber, we only had "the shape of things to come," indicated by the Fairey long-range high-wing monoplane. Our nearest comparable service types of that year were the Vickers Virginia night bomber and the Boulton Paul Sidestrand day bomber which "straddled" the Boeing as regards size and which were slightly lower powered, each having two 450 h.p. Bristol motors. Taking the Sidestrand as a more favourable comparison, we find that it was 20 miles an hour slower with approximately the same ratio of gross to tare weight.

Another large aeroplane which has become well known by name to the British public is the Liberator, produced by Consolidated. This firm, which was established in 1923, had many years' successful experience with aeroplanes and biplane boats. In 1935 they produced the P2Y1, ancestor of the PBY (Catalina), which was their first monoplane type. In 1935 they were given a contract for 60 of these boats—the largest United



. . . . 300 m.p.h., seven miles high, for 3,000-4,000 miles.

. . . . . very good looking, particularly in its Alclad unadorned by camouflage

States Navy contract since the last war. One unusual feature was the fitting of wing-tip retractable floats. This aircraft set up, in 1935, a new international distance record of 3,443 miles non-stop, and, after that, made many successful long formation flights.

The Catalina (Model 28), which has been so very successful as a reconnaissance flying boat in our hands, was, of course, publicised recently by the good work it did in making contact with the *Bismarck*. It was also a boat of this type which, while being delivered across the Atlantic, lost both its ailerons after the automatic pilot, jamming the aileron controls, caused the aircraft to dive almost to sea level before any sort of control was regained. It says much for the stability of the aircraft that her pilot managed to bring her home in very rough weather without any lateral control.

The PBY has a semi-cantilever wing with the centre-section mounted on a streamline superstructure which allows the airscrews to be set up well clear of the water and also close inboard, thus reducing the yawing moment with one engine stopped. The motors are two 1,000 h.p. Twin Wasps and general dimensions are: Span 104ft., weight empty 14,240 lb., weight loaded 27,000 lb. Its top speed is 199 miles per hour with a ceiling of 25,000ft. and a range of 4,000 miles. When Cyclones are fitted the top speed rises to 206 miles per hour.

On the question of the wing-tip retractable floats it does seem that the gain in performance by retraction must be extremely small as against the added weight and mechanical complication of the retraction gear.

Breaking away from the PBY lines, Consolidated produced the models 29 and 31, which were boats strongly reminiscent of Short practice with one transverse step and a knife-edge vertical rear step such as was first introduced in the Empire boats in 1936 by Shorts. These aircraft also have semi-retractable floats approximately half-way out on the span of the wing; they also embody a retractable tricycle beaching gear. The model 31 is powered by two Duplex Cyclones of 2,000 h.p. each and carries a crew of five; the span is 110ft. with a gross weight of 50,000 lb. This aircraft was hailed as the most efficient flying boat in the world, this possibly being due to the fact that it used the Davis aerofoil.

Al Fresco Production

The model 29 or XPB 2Y-1 is similar to the model 31 but is a four-engined version powered by 1,050 h.p. Twin Wasps.

The latest of Consolidated types is the Liberator Model 32, which again uses the Davis aerofoil and is being delivered in considerable quantities to the R.A.F. This bomber, with tricycle landing gear, has an all-up weight of 41,000 lb., its span is 110ft., and it is powered by four 1,200 h.p. Twin Wasps. A very interesting point about its production is that 30 per cent. of the manufacturing operations are completed outdoors. The Consolidated Company obviously has here a very good ally in the Californian weather, for if such a system were attempted in this country the resulting manœuvres would rather resemble the weather gadget where a little man with an umbrella comes out when it rains and the lady comes out when it is fine.

The Liberator is very imposing in its night-bomber black, but one is struck by the very low ground clearance under the belly of the machine, which must make the bombing-up operations rather difficult. The structural work is extremely robust and the workmanship is excellent. It is understood, however, that the wing is constructed in one piece, which may be of some advantage in production but which will surely make repair schemes rather difficult. This aeroplane should be a very formidable addition to our bombing force when British armament is installed.

Quick Work

In the summer of 1938 the Liberator was merely a drawing-board layout, but it has already been in full production for some time now, a remarkably good performance for such a big aircraft.

Although official performance details of this aeroplane are not available, the latest version (according to recent American reports) will fly at over 300 miles per hour, seven miles high, for 3,000-4,000 miles, and will be fully equipped with turrets and armour and carry a bomb load exceeding four tons. Its performance must be ascribed, to a great extent, to the Davis aerofoil with its very high L/D.

By a recent agreement three firms are to build this aircraft in the States. Fords are building a large factory at Ypslanti which will provide assemblies for erection at two new factories under the control of Consolidated and Douglas, where continuous assembly lines, three abreast, will produce the aircraft at a rate of 50 per month.

The Douglas Company, which was established in 1920, first made itself known to the British public by the excellent performance of the D.C.2 "Flying Hotel" in the Mac-Robertson race to Melbourne in 1934. This aircraft was developed from the D.C.1 and followed on to the D.C.3. After that, Douglas became tricycle-minded in the D.C.4 and later in the D.C.5. This firm has always remained faithful to the single fin and rudder, as have Shorts in this country, in spite of the trend towards two or even three vertical surfaces. A military form of the D.C.3 is the B.18A bomber, powered by two Cyclones and having a top speed of 225 miles per hour. Three hundred and fifty of these are in service with the United States Air Corps. A further development of the 18A is the DB.28A, which is going into service over here under its R.A.F. name of the "Digby," and which can be used as a troop carrier accommodating 17 men (Paratroops?). The B.23 is another United States improvement on the 18A

. . . took pictures of Taranto Harbour after the Fleet Air Arm had dropped in to pay a call.

BETTER U.S. BOATS AND BOMBERS

. . . . . span is 110ft. with a gross weight of 50,000 lb.

Although I described the D.B.7 type in my last article on fighters, it may be worth while to discuss it again in its guise as a bomber. In its latest form, with unspecified engines of greater power, it has achieved in the States a speed of 380 miles an hour. This aircraft was designed essentially for production, the wing being in four parts, the fuselage in three and the tail unit in seven. The D.B.7 differs from the 7A in that the former uses Twin Wasps and the latter Cyclones. The main criticism to level at an otherwise excellent aeroplane is that the crew of three are located in the slim fuselage in such a manner that none of them can move over in an emergency to any of the other stations.

The latest Douglas type is the very large B.19, powered by four Duplex Cyclones of 2,000 h.p. each. In this age of superlatives it is difficult to find comparatives to describe relative sizes, so plain dimensions are the only adequate means of description. The span is 212ft., and the all-up weight 164,000 lb. (empty weight 82,200 lb.). The B.19 has a speed range from 69 miles an hour to 310 miles an hour, a ceiling of 22,000ft., and a normal range of 7,500 miles. A crew of ten is carried and the aircraft can be used to carry 125 troops. Other less important but still remarkable dimensions are: height over rudder 42ft. and main wheel diameter 8ft. 4in. The undercarriage forgings for this colossus were so large that a special turret lathe—the biggest in the world—had to be constructed to machine them.

Douglas are also producing several dive-bomber types, and on this subject it is interesting to recall that, although the Germans have "popularised" (or is that the right word?) the dive bomber, this type has been in use for a considerable time in the States. It was used as a theme for many of their films "glorifying" the United States Air Corps, and we used to be inspired by the very pretty sight of Curtiss "Hell-divers" peeling off from their formations. The two dive-bomber types now being produced by the Douglas are the 8A-3 and the 8A-5. These aircraft are structurally very interesting, as the fuselage is divided horizontally, the lower half being integral with the wing centre-section.

Maryland Genealogy

The Martin factory, established in 1909, was recently considered the best production unit for metal aircraft in the United States, and has produced some very good land planes and boats. Of land planes, we have already in service with the R.A.F. the Marylands, or Model 167. This aircraft has done remarkably good service in the Near East, and, amongst other things, took the pictures of Taranto Harbour after the Fleet Air Arm had dropped in to pay a call.

This type has a very distinctive family history which goes back to the Martin Model 123, which was designed in 1932. It was a very clean design of open-cockpit, two-motor bomber, which, with two 650 h.p. Cyclones, had a top speed of about 200 miles an hour. This was followed by the Model 193 with covered cockpits, then the 146 and 166, and so to the 167, which is powered by two 1,050 h.p. Twin Wasps or two 1,100 h.p. Cyclones. The span of this aircraft is 61ft., its maximum overload weight is 16,600 lb., top speed 280 m.p.h., with a ceiling of 28,000ft. American armament consists of four wing-guns and two guns top and bottom in the rear position. Two or three things strike one in examining this aircraft, one being the slimness of the fuselage with the disadvantages (in common with the Boston) of the crew's inability to change stations. Another point is the layout of controls and gadgets. This is very neatly done, but, on examination, it would seem that the maintenance and repair people would have to be both contortionists and experts at jigsaw puzzles, as everything that one would normally want to get at quickly seems to be covered in—very neat, no doubt, but not too practical for wartime operations!

Nice to Handle

The position of the tailplane is interesting. It has been set above the normal line of the rear fuselage, which might suggest that Martins originally had trouble with buffeting and had to raise it out of the region of the turbulent wake of the mainplane.

The smoothness of all flying controls, in which they compare favourably with British types, has been a subject of favourable comment by pilots who have flown most of the American aircraft we have over here, including the Maryland; and yet, on examining the control runs of various American aircraft, there seem to be far more changes in direction and cross-shafts than in comparable British types.

The Martin Model 162 is a very efficient boat with a gull wing and a pronounced dihedral on the tail plane which carries twin fins and rudders. Retractable wing-tip floats are again featured—and how pleasantly novel it is to see three turrets incorporated in the design! This boat was designed after a quarter-scale prototype had been tested in 1937. This was the Model 162A, which proved extremely accurate in its forecast of the performance and characteristics of the full-scale 162. It may be remembered that Saunders-Roe and Short Bros. have used a similar method of prototype testing, Saunders-Roe producing that very attractive Model 37 boat with four 95 h.p. Pobjoys.

Lockheeds, one of the youngest of the U.S. companies, have provided a very valuable and considerable addition to our air strength in the Hudson, a variation of their Model 14 transport. This aeroplane has been most successful as a reconnaissance and light bomber type and, equipped with a Boulton Paul power-operated turret, has given a remarkably good account of itself in fighting off and destroying enemy fighters. The original firm was started by the Loughhead brothers in 1916, who produced what was the forerunner of the true streamline aeroplane, and many will remember the lovely lines of the Vega, Orion, Altair and the Sirius, which were outstanding in their time for their good looks and high performance. Most remarkable was the Speed-Vega of 1931 which, as the

. . . . . equipped with a Boulton Paul power-operated turret, has given a remarkably good account of itself.

BETTER U.S. BOATS AND BOMBERS

YIC-17 military transport powered with a 400 h.p. Wasp motor, had a top speed of 221 miles per hour.

Other military types are the 212A, derived from the Lockheed 12, and, lately, the Ventura, derived from the Lodestar, which has two 1,200 h.p. Twin Wasps, a top speed of 260 miles per hour, a range of 1,700 miles and a ceiling of 27,000ft.

Turning to production matters, Lockheeds have recently announced the development of an electrolytic system for the transfer of templates, which allows the reproduction of a template every five minutes. The plant costs only 5,000 dollars, or alternatively can be adapted from an hydraulic press. Costs work out at ten cents per square ft. as against a dollar per square ft. by hand methods, and Lockheeds have found that two men operating this equipment have a capacity, each day, equal to 500 man-hours of copying templates in the usual manner, with the additional advantage of consistent accuracy.

North American Aircraft came into the design field in 1934 and have provided us with a considerable number of Harvard trainers. In view of the characteristic sound of its Wasp, this aircraft may be considered to be the "big noise" at many of our training units. North Americans are now producing a very interesting tricycle bomber, with two G.R.2600 Cyclones, which has a span of 67ft., an all-up weight of 24,000 lb., a speed range of 84 to 308 miles per hour, a ceiling of 25,000ft. and a range of 2,650 miles.

. . . . . 310 m.p.h., a ceiling of 22,000ft. and a normal range of 7,500 miles.

In conclusion, when one considers the potentialities of American aircraft production in all military types, one is bound to realise with thankfulness that, given time for their production to grow and to be put into operation over here, there is no military power in the world which can stand up to the weight of bombs which we shall be able to deliver, carriage paid, "leased and lent" to our friends the enemy. Even those of us who believed, before the war, that the United States would be able to come into quantity production in a big way must be amazed at the rapidity with which they have got going. In one year American aircraft production has increased 400 per cent. Some time ago they reached a figure of 1,600 military aircraft per month, and three engine firms alone recently produced 3,300 engines in one month. Although they have still a lot to learn as regards war operational needs, I feel convinced that, in the matter of sheer production, neither this country nor Germany, despite their enormous efforts, will be able to hold a candle to the United States by the end of 1942.

. . . . . with unspecified engines . . . . . has achieved in the States a speed of 380 m.p.h.

BOOK REVIEW

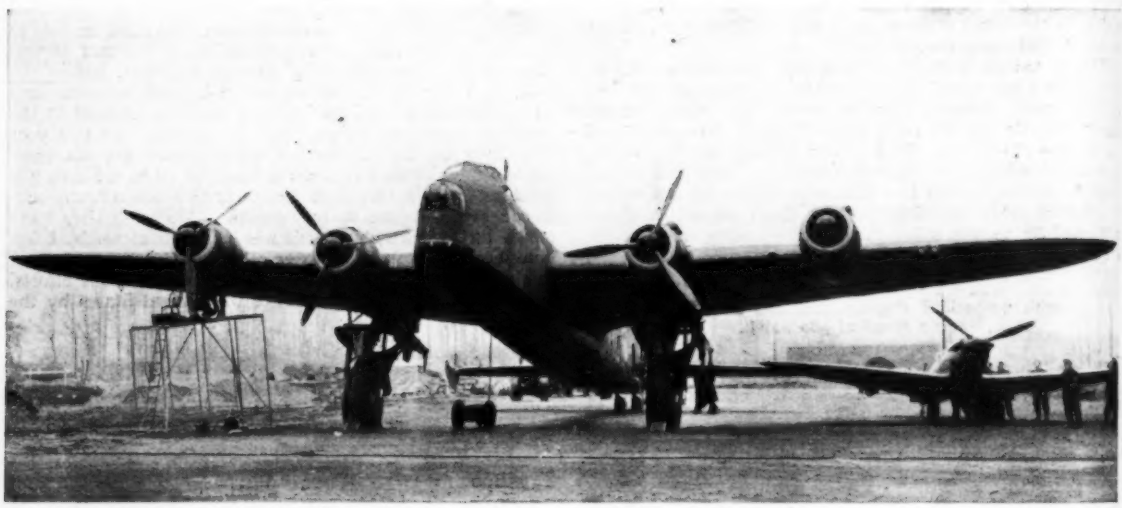
British Fighter Planes, by C. G. Grey. (*Faber and Faber, 5s. net.*)

A BOOK on aircraft by Mr. Grey, lately editor of the *Aeroplane*, is sure of a warm welcome from the reading public. Mr. Grey's literary style, though it might be described as largely distinctive of himself, is attractive and eminently readable. His memory is remarkably good, and his knowledge of the development of all aspects of flying from very early days is extensive.

The first section of this book runs through the history of the fighter aeroplane from the early days of the last war up to the end of the Battle of Britain. Next Mr. Grey proceeds to discuss armament and armour with more history, and includes a chapter on night fighting. The third and fourth sections are the most detailed. They deal with the development of the firms which have made fighters and the engines used in them, and a good deal of the biography of leading personalities in those firms is introduced. How many of the thousands of people who have subscribed to Spitfire Funds know the name of the late R. J. Mitchell? Mr. Grey's tribute to that gifted designer certainly does not overstate the honour which is due to his memory. The designers and builders of the Hurricane, the Defiant, the Whirlwind, the Blenheim Fighter, and of the Bristol and Rolls-Royce aero engines are likewise introduced to the public. It is good that the public should know something about these brilliant men.

THE SHORT STIRLING

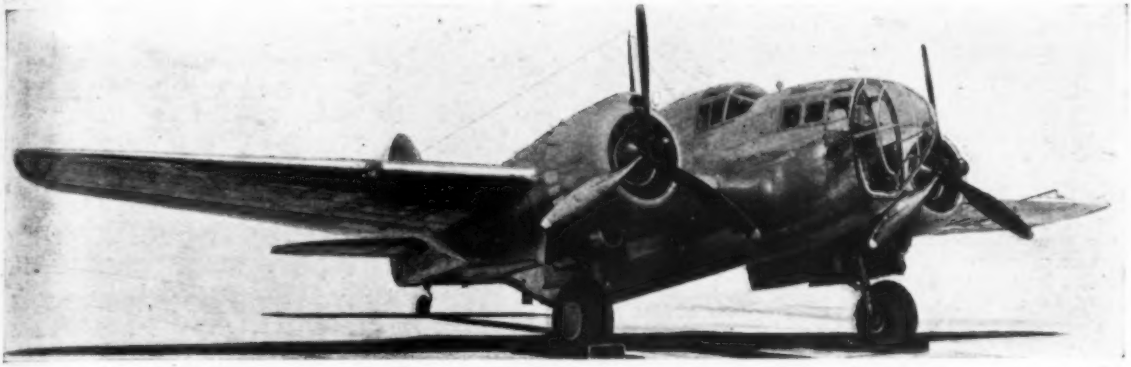
Official Photographs of One of Britain's New Four-engined Heavy Bomber Types



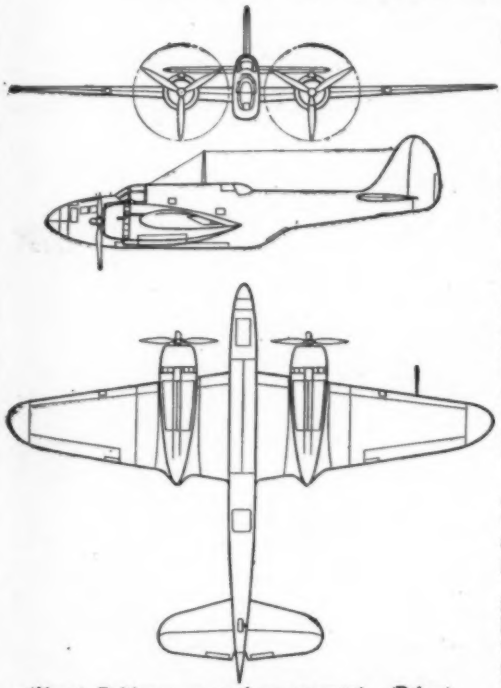
The Short Stirling heavy bomber has either Bristol Hercules 14-cylinder air-cooled radial 1,400 h.p. engines or Wright Cyclone double-row 14-cylinder air-cooled radial engines. It has a wing span of 99ft., a length of 87ft. 3in. and a height of 22ft. 9in. There is a very heavy defensive armament. The undercarriage and tail wheel are retractable.

TWO MARTIN BOMBERS

The 187 Baltimore and the B-26



THE MARTIN 187 BALTIMORE has been expressly designed to Royal Air Force requirements



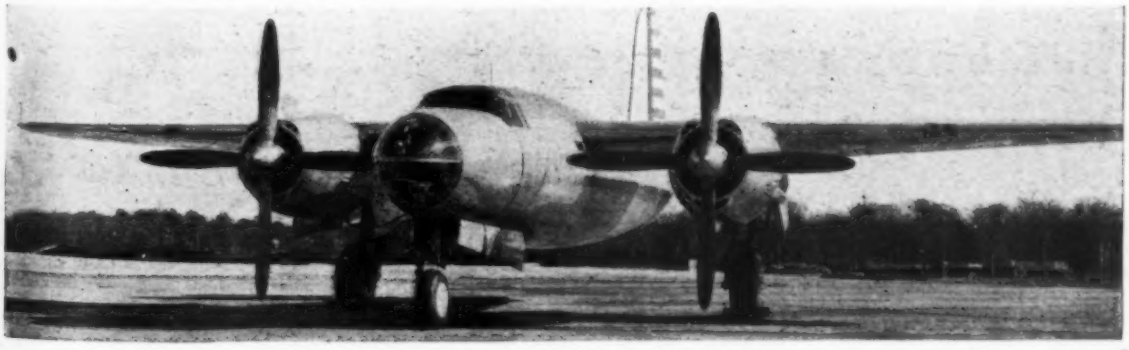
(Above) Baltimore general arrangement. (Below) The Martin B-26 bomber. A very "modern" design making full use of advances in plastics.

THE first release of official information on the Baltimore, which the Glenn L. Martin Company is building for Britain, can now be made. This medium bomber was given its first test flights on June 14th, at the Martin factory in Baltimore, and is reported to have thoroughly satisfied its builders. No doubt it will also satisfy the Royal Air Force, to whose express requirements it has been designed, and should prove a worthy successor to the Maryland reconnaissance bomber which has done so well in the actions in the Mediterranean. (The company designation of the Maryland is Model 167, while the later Baltimore is the Model 187.)

The Baltimore is designed for versatility, and with its bomber duties will combine the functions of long-range reconnaissance, and perhaps even fighting. For it is believed to be among the fastest twin-engined bombers and also carries heavy offensive and defensive armament, including a power-operated gun turret. It is heavier than the Maryland but lighter than that other Martin bomber, the B-26. (B-26 refers to the U.S. Army Air Corps specification to which it was designed.) The B-26 was described with photographs in *Flight* of January 23rd, and it was then remarked that "this machine should not be confused with the Martin 187, building for Britain."

The Baltimore is a mid-wing monoplane powered with two Wright engines of 1,600 h.p. (presumably 14-cylinder Cyclones). It has the type of moulded plastic nose, giving good visibility for the bomb-aimer, first seen on the B-26. The engines of the B-26 are more powerful, being 18-cylinder Pratt and Whitneys of 1,850 h.p. each.

The differences between the two are significant. Though the B-26 is more "modern" in appearance with its beautifully shaped fuselage and its nosewheel undercarriage, compared to the Baltimore's tail wheel and its bomb bay underneath, it may be that the Baltimore is better adapted to the rough and tumble which is war. But perhaps the B-26 will prove to be a bomber which is both pleasant to behold and efficient at its job. The name Marauder has not yet been accepted officially for it over here.



ANOTHER ENGINE LAYOUT

Novel Cylinder Arrangement Patented by Daimler-Benz

THE quest for power continues. The ding-dong battle between the air-cooled and the liquid-cooled goes on; first one seems to be a little ahead, then the other. And in both classes the number of cylinders and their arrangement have been the cause of many a headache. We have had the 9-cylinder radial single-row, the 14-cylinder double-row, the 18-cylinder double-row, and various numbers of cylinders in line behind one another in three rows; this in the air-cooled class. In the liquid-cooled we have had the V-12, the H-16, the H-24, and the X-24. And now German designers come along with yet another suggestion. It may be nothing more than that at the moment, or it may be undergoing tests; at any rate, the Daimler-Benz company has taken out patents on a 36-cylinder arrangement.

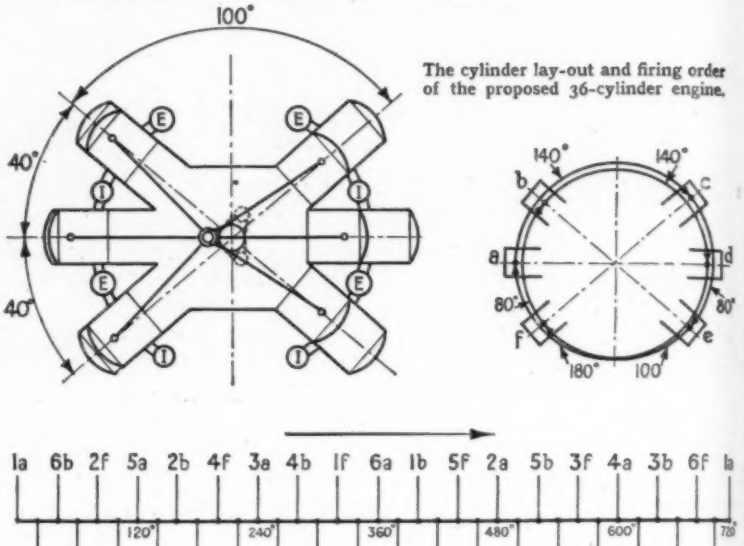
Actually the patent does not limit the number of cylinders, but the 36-cylinder 4-stroke has been used as an example. The cylinders are arranged in six banks of six each, the banks being arranged with an angle of 40 deg. between them, and a gap of 100 deg. between groups.

The objects stated in the patent are mechanical balance, uniform torque, small frontal area, and a compact outline suitable for installation in wings or fuselage (the major axis of the unit may be horizontal or vertical), and good accessibility. In the 36-cylinder unit illustrated, the firing interval is 20 deg. of crank angle. A conventional six-throw crankshaft is used with, presumably, two master rods and four auxiliary rods on each crankpin.

The firing order may be ascertained by following the intersecting circles in the diagram. Starting from cylinder *a*, the piston of which is at top dead centre on the firing stroke, the next explosion occurs in cylinder *c* after 140 deg. crank rotation; then successively in *e* after 80 deg., *f* after 100 deg; *b* after 80 deg., and finally *d* after 140 deg. to complete the cycle. The cranks receive their power impulses in the following order: 1, 5, 3, 6, 2, 4, and thus the sequence for the 36 cylinders at intervals of 20 deg. is as shown in the line diagram.

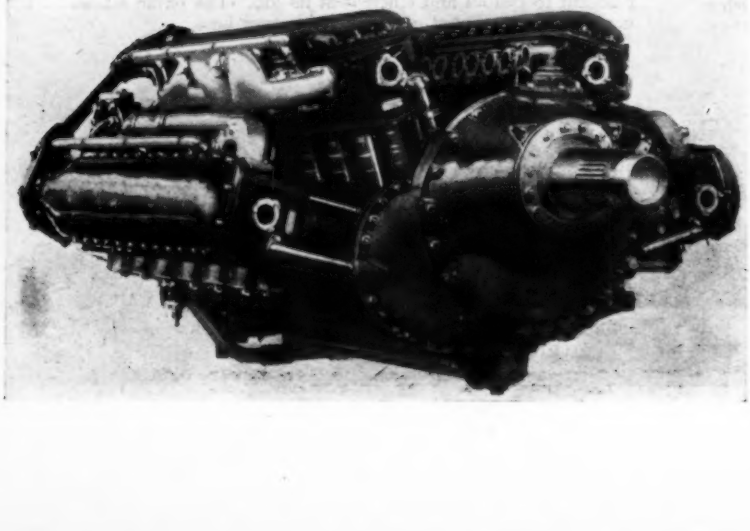
In order to reduce as much as possible the number of inlet and exhaust ducts, these are arranged to serve pairs of cylinders. On the drawing the inlet and exhaust manifolds are indicated by the letters *I* and *E* respectively.

It is a little difficult to follow the argument of the Daimler-Benz company. For instance, the frontal area will be the same whether the six banks of cylinders are arranged as in the patent specification or in the more usual symmetrical way, with 60 deg. between banks. For wing installation the "flatter" D-B engine might make a slightly better fairing, although an engine of some 2,000 h.p. or more could not be buried in a wing of normal thickness-chord ratio unless the aircraft were vastly larger than anything contemplated hitherto. For nose installation it might be an advantage to place the engine with the major axis vertical so as to give the pilot a better view.



The cylinder lay-out and firing order of the proposed 36-cylinder engine.

ALLISON 24-CYL. DOUBLE VEE ENGINE



THE Allison Company has developed a 24-cylinder liquid-cooled engine which consists essentially of two of their 12-cylinder V-1710 engines joined together in the form of a double Vee with an angle which appears to be 150 deg. between the two outer banks. The V-1710, which was described in *Flight* for June 19th, page 419, has an included angle of 60 deg. From the illustration of the V-3420, as the new engine is called, the angle between the two middle banks is 30 deg. There are two crankshafts geared to the one airscrew shaft through reduction gearing. The type number of both the engines comes from their capacity in cubic inches. Output of the 24-cylinder will be approximately twice that of the V-1710, which is rated at 1,150 h.p.

Service Aviation

Royal Air Force and Fleet Air Arm News and Announcements

V.C. Awarded.

THE KING has been graciously pleased to confer the Victoria Cross on Act. Wing Commander Hughie Idwal EDWARDS, D.F.C., of No. 105 Squadron, in recognition of most conspicuous bravery.

The official citation reads:—

Wing Cdr. Edwards, although handicapped by a physical disability resulting from a flying accident, has repeatedly displayed gallantry of the highest order in pressing home bombing attacks from very low heights against strongly defended objectives. On July 4 he led an important attack on the Port of Bremen, one of the most heavily defended towns in Germany. This attack had to be made in daylight, and there were no clouds to afford concealment. During the approach to the German coast several enemy ships were sighted, and Wing Cdr. Edwards knew that his aircraft would be reported and that the defences would be in a state of readiness.

Undaunted by this misfortune, he brought his formation 50 miles overland to the target, flying at a height of little more than 50 feet, passing under high tension cables, carrying away telegraph wires and finally passing through a formidable balloon barrage. On reaching Bremen he was met with a hail of fire, all his aircraft being hit and four of them being destroyed. Nevertheless, he made a most successful attack, and then with the greatest skill and coolness withdrew the surviving aircraft without further loss.

Throughout the execution of this operation, which he had planned personally with full knowledge of the risks entailed, Wing Cdr. Edwards displayed the highest possible standard of gallantry and determination.

Wing Cdr. Edwards, V.C.

THE KING has been graciously pleased to approve the following awards for gallantry and devotion to duty in the execution of air operations:—

DISTINGUISHED SERVICE ORDER.

Wing Commander G. A. WALKER.—No. 50.
Act. Wing Cdr. S. T. MISSELBROOK.—No. 44.

BAR TO THE DISTINGUISHED FLYING CROSS.

Flt. Lt. P. R. BURTON-GYLES, D.F.C.—No. 207.

DISTINGUISHED FLYING CROSS.

Acting Wing Commander B. V. ROBINSON.—No. 78.
Acting Wing Commander R. E. SHARP.—No. 214.
Squadron Leader J. B. BLACK.—No. 99.
Act. Sqn. Ldr. T. N. C. BURROUGH, R.A.F.V.R.—No. 50.
Act. Sqn. Ldr. W. M. MORRIS, R.A.F.O.—No. 15.

OUT OF THE LAND OF EGYPT: Air Marshal Tedder, A.O.C. in C., Middle East Command, arriving by Lockheed Lodestar at an R.A.F. station in Palestine from Cairo.

Acting Squadron Leader I. G. RICHMOND.—No. 218.
Flight Lieutenant J. H. L. BLOUNT.
Flt. Lt. K. T. A. HARVEY, R.A.F.O.—No. 99.
Act. Flt. Lt. D. L. ARMITAGE, R.A.F.V.R.—No. 266.
Act. Flt. Lt. J. H. FRANKS, R.A.F.V.R.—No. 149.
Acting Flight Lieutenant L. E. GILES.—No. 115.
Act. Flt. Lt. K. HUMBY, R.A.F.V.R.—No. 10.
Act. Flt. Lt. J. F. G. JENKINS, R.A.F.V.R.—No. 18.
Acting Flight Lieutenant J. R. RAINFORD.—No. 83.
Acting Flight Lieutenant N. E. SHARP.—No. 51.
Flying Officer K. J. FOSTER, R.A.F.V.R.—No. 51.
Flying Officer H. J. HEAL.—No. 10.
Flying Officer E. B. RENDALL.—No. 50.
Flying Officer N. S. ROYLE, R.A.F.V.R.—No. 83.
Act. F/O. K. J. FALCONER, R.A.F.V.R.—No. 214.
Act. F/O. I. D. JEREMY, R.A.F.V.R.—No. 305 (Pol.).
Pilot Officer H. P. BRANCKER, R.A.F.V.R.—No. 18.
Flying Officer L. G. BULL.—No. 109.
Pilot Officer J. DAWSON, R.A.F.V.R.—No. 9.
Pilot Officer P. DOBSON, R.A.F.V.R.—No. 102.
Pilot Officer G. G. DOVE, R.A.F.V.R.—No. 144.
Pilot Officer J. H. LODER, R.A.F.V.R.—No. 115.
Pilot Officer A. PATERSON, R.A.F.V.R.—No. 49.
Pilot Officer G. G. PETTY.—No. 83.
Pilot Officer G. R. SIMICH, R.N.Z.A.F.—No. 75 (New Zealand).
Pilot Officer M. A. SMITH, R.A.F.V.R.—No. 44
Pilot Officer R. M. SMITH, R.A.F.V.R.—No. 40

DISTINGUISHED FLYING MEDAL.

Flight Sergeant J. E. HANSON.—No. 50.
Flight Sergeant S. T. HARPHAM.—No. 83.
Flight Sergeant G. P. JONES.—No. 77.
Flight Sergeant W. MCCABE.—No. 149.
Flight Sergeant K. MCKENZIE.—No. 106.
Flight Sergeant R. A. NEWTON.—No. 75 (N.Z.).
Flight Sergeant J. R. G. RALSTON.—No. 107.
Sergeant J. A. ARMOUR.—No. 50.
Sergeant J. F. BECKETT, R.A.F.V.R.—No. 49.
Sergeant J. H. BENTLEY.—No. 49.
Sergeant B. C. COATES, R.A.F.V.R.—No. 58.
Sergeant J. W. CORFIELD.—No. 83.
Sergeant P. W. K. CRISP.—No. 58.
Sergeant A. D. W. CURR, R.A.F.V.R.—No. 82
Sergeant W. T. ELLIS.—No. 82.
Sergeant R. J. FLUX.—No. 83.
Sergeant T. H. GALLOWAY, R.A.F.V.R.—No. 106.
Sergeant G. GASCOYNE.—No. 75 (New Zealand).
Sergeant C. GIBSON, R.A.F.V.R.—No. 144.
Sergeant R. A. GOODE.—No. 21.
Sergeant F. HAIGH.—No. 75 (N.Z).
Sergeant M. G. HARRIS, R.A.F.V.R.—No. 75 (N.Z.).
Sergeant W. HIRST.—No. 49.
Sergeant D. A. HOWARD, R.A.F.V.R.—No. 106
Sergeant L. R. JOHNSON, R.A.F.V.R.—No. 10.
Sergeant J. C. KESSON.—No. 77.
Sergeant P. E. MERRALLS, R.A.F.V.R.—No. 49.
Sergeant J. W. MIDDLETON.—No. 77.
Sergeant J. E. ROBBINS.—No. 40.
Sergeant E. C. ROBERTS.—No. 50.
Sergeant C. R. SPENCER.—No. 77.
Sergeant K. S. STAMMERS, A.A.F.—No. 44.
Sergeant F. STOTT, R.A.F.V.R.—No. 44.
Sergeant J. W. TINDALL.—No. 58.
Sergeant L. E. W. WEBB, R.A.F.V.R.—No. 21.
Sergeant G. WILSON, R.A.F.V.R.—No. 107.
Sergeant B. YEADON.—No. 83.

THE KING has been graciously pleased to approve the following awards:—

GEORGE MEDAL.

Sgt. G. H. ELLIS, R.A.A.F.—This airman was the observer in a Wirraway aircraft which crashed and burst into flames when the pilot failed to make a successful forced landing necessitated by engine failure. The flames enveloped the whole of the fuselage. Sgt. Ellis escaped with a dislocated shoulder, abrasions to his face and arms and slight burns, but the pilot was trapped. In spite of his injuries, Sgt. Ellis re-entered the flaming aircraft, released the pilot and assisted him to escape. This most courageous act did not, unfortunately, save the pilot's life, and the additional severe burns which Sgt. Ellis sustained almost proved fatal.

Cpl. J. W. DEACON, R.A.F.; Gnr. T. GAGE, R.A.—One evening in February, 1941, an aircraft crashed into the side of a hill near an aerodrome and caught fire. Cpl. Deacon, Gnr. Gage and another soldier ran to the scene of the accident and found one member of the crew on the main plane. They dragged this airman to safety. The airman then informed his rescuers that three other members of the crew remained in the aircraft. Deacon and his companions immediately returned to the burning aircraft and, despite the added danger from exploding cannon shells and small arms ammunition, they succeeded in dragging clear the other members of the crew.

Sgt. M. BELL, R.A.F.—One night in February, 1941, an aircraft crashed and burst into flames. The pilot was found, with his clothing on fire, by Sgt. Bell, who dashed through the flames from the burning wreckage and, with his own jacket, extinguished the flames from the pilot's clothing, which was soaked with petrol. This action was performed in spite of the further danger from constantly exploding cartridges. Sgt. Bell also directed his team of orderlies and ambulances so well that the injured pilot was receiving attention in hospital within 22 minutes from the time of the crash. Unfortunately the pilot subsequently died of his injuries. This is the second occasion Sgt. Bell has displayed great courage and efficiency. Previously his promptitude was responsible for saving one of the crew of a burning aircraft.

A/C.2 C. L. WHEATLEY, R.A.F.—When an aircraft carrying a full load of bombs crashed, this airman, with the help of the fire picquet, tried valiantly to prevent the fire from the port engine and petrol tank spreading to a large high explo-

SERVICE AVIATION

sive bomb. The success of his efforts was due to his complete disregard for his personal safety, for, standing as he did two yards in front of the bomb, he was aware that it was likely to explode at any time.

O.B.E.

THE KING has been graciously pleased to give orders for the following appointment to the Most Excellent Order of the British Empire:—

To be an Additional Member of the Military Division of the said Most Excellent Order:—

Act. Flt. Lt. W. R. HARDEMAN.—When an aircraft loaded with four 250 lb. bombs was set on fire, there was grave danger to nearby aircraft and hangars. The bomb release gear was damaged, and in order to remove the bombs Flt. Lt. Hardeman successfully sawed through and wrenched the carriers from the burning aircraft. On another occasion he removed the bombs from a burnt-out aircraft which had crashed. During the early part of the war Flt. Lt. Hardeman was dealing with an unexploded bomb when an enemy aircraft dropped bombs on the working party, killing two of the party and wounding others. Flt. Lt. Hardeman summoned medical assistance and attended the wounded whilst the raid was still in progress. Throughout he has shown the greatest courage and a complete disregard for his personal safety.

B.E.M.

THE KING has been graciously pleased to approve the following awards of the British Empire Medal (Military Division) to the undermentioned:—

Cpl. R. P. G. DUNLOP, A.A.F.—On two consecutive nights in December, 1940, this airman displayed great devotion to duty and indifference to personal safety during air attacks. On the first night he and another airman volunteered to go out and investigate the failure of telephone communications with a particular site and assisted several crews to dispose of incendiary bombs which had fallen nearby, while shrapnel and high explosive bombs were still falling. On two further occasions he and his companion toured the sites over roads made difficult by masses of debris. In one instance a bomb narrowly missed their van, the steering wheel being torn from the driver's grasp. During the heavy raid on the second night Cpl. Dunlop rendered valuable assistance in deflating and replacing a balloon which had become badly holed.

Cpl. F. THURLOW, R.A.F.; A/C.2 T. WILLIAMSON, R.A.F.—One day in March, 1941, an aircraft crashed outside an aerodrome and immediately caught fire. Corporal Thurlow and Aircraftman Williamson, members of the station fire fighting crew, approached the burning wreckage with their hoses and, although they realised that the aircraft might be carrying bombs, advanced to within 10 feet of the conflagration in order that by directing their hoses from a close position, the flames might be subdued quickly and a rescue possibly effected. Unfortunately, however, the four occupants of the aircraft had been killed. These two airmen displayed great courage and a complete disregard of danger, and both were wounded when a heavy bomb exploded. Cpl. Thurlow has shown great bravery on previous occasions when dealing with burning aircraft.

L.A/C. E. R. RUDDY, R.A.F.—One day in February, 1941, an aircraft crashed on an aerodrome. On impact, a bomb exploded and the aircraft caught fire, whilst the remaining bombs exploded in succession as the aircraft was sliding along the ground. When the first explosion occurred, L.A/C. Ruddy started his ambulance, and reached the crash as soon as the aircraft came to rest. Although the aircraft was burning furiously and ammunition and oxygen containers were continuously exploding, L.A/C. Ruddy, who was unaware that all the bombs had exploded, assisted the pilot and observer to escape. By his gallant action their two lives were undoubtedly saved. The remaining occupant, the air gunner, was killed.

London Gazette

Royal Air Force

Air Ministry,
July 18, 1941

General Duties Branch.

The folg. are granted commns. for durn. as P/Os. on probn:—Temp. W/Os.: (June 10) R. T. Langton, D.F.M.; (June 19) G. C. Day. Flt. Sgts.: (May 8) I. J. Badger; (June 5) S. D. Way; (June 19) H. O. Stephens. Temp. Flt. Sgt.: G. Hall. Sgts.: (March 1) A. J. J. Kirk; (April 26) D. M. Keys; (June 5) P. T. H. Maggs; (June 8) W. K. Ongley; (June 10) L. R. Sutton; (June 12) R. W. Smith, D.F.M., A. R. Edgar, A. G. Williams; (June 19) K. C. Rawles Temp. Sgt.: C. W. Cowan, D.F.M.

The folg. P/Os. on probn. are confmd. in their appts. and promoted to war substve. rank of F/O.:—(Apr. 1) H. A. Clark, D.F.C.; (May 12) G. E. Cruwys; (June 21) G. C. Brunner; (June 23) A. F. Chisholm; (July 1) A. West, A.F.M.; (July 2) G. F. Reid, D.F.C.; (July 4) C. B. Walter; (July 9) J. A. Cant; (July 10) M. F. Patrick; (July 11) J. B. P. Hanlon; (July 12) F. Squire; (July 15) J. N. Owen; (July 15) J. G. B. Hartley; (July 17) R. A. Howard.

The folg. F/Os. are promoted to war substve. rank of Flt. Lt.:—(Dec. 3, 1940) H. P. Powell; (Apr. 16) J. J. E. Mahoney; (Apr. 25) W. H. Hankin; (Apr. 27) J. R. Whelan, D.F.C.; (May 24) H. J. Soper (ret.); (June 4) D. W. Cathercole; (June 17) H. J. Cundall, H. N. Garbett, J. E. R. Hayter, J. A. Holmes, H. A. B. Porteous; (June 25) F. G. Quick; (June 29) R. A. D. Meharey, N. A. Sellars.

F/O. J. E. Hibbert is granted war substve. rank of Flt. Lt. (May 9).

The folg. P/Os. are promoted to war substve. rank of F/O.:—(Apr. 6) J. Atkinson, J. Curchin, D.F.C.; (Apr. 7) F. W. Alder; (Apr. 10) J. H. Young; (Apr. 28) O. V. Tracey; (May 25) F. G. De Sieyes; (June 2) J. F. Soden; (June 8) W. G. C. Gasquoine, N. R. Mansfield, L. E. F. Parry, E. B. Topp; (June 24) R. A. Vinson; (July 6) A. E. Bigelow.

P/O. on probn. F. W. Cook is promoted to war substve. rank of F/O. on probn. (May 15) (substd for notifn. of July 4).

Air Comdre. L. N. Hollinghurst, O.B.E., D.F.C., is granted act. rank of Air Vice-Marshal (July 1).

F/O. E. T. Francis is granted an antedate in seniority of July 13, 1940.

The folg. are transfd. to Technical Branch:—Wing Cdr.: (Apr. 24, 1940) H. D. Spreckley. Sqn. Ldr.: R. G. R. Buckley. Flt. Lt.: (May 19) M. G. Stevenson

P/O. T. C. Usher (2nd Lt., R.A.) relinquishes his temp. commn. on return to Army duty (June 13).

F/O. K. B. T. Burne resigns his short service commn. (June 29).

F/O. B. C. Bell resigns his commn. (July 5).

Erratum.

In the notifn. of June 27 concerning F/O. R. J. Wells *for* Mar. 4, 1941, *read* Mar. 4, 1940.

Technical Branch.

The folg. are granted commns. for durn. as F/Os. on probn.:—W.Os.: (Apr. 20) W. C. Parsons; (May 28, Ser. Nov. 22, 1940) W. V. Pawson; (June 1) G. W. Martin; (July 1) A. E. Ward. As P/Os. on probn.:—W/Os.: (May 20) H. E. A. Pratt; (June 12) R. Cunningham; (May 5) E. B. Symonds. Flt. Sgts.: (May 14) F. B. Storingett; (May 17) C. L. Bessey; (June 19) H. J. W. Coward; (June 20) A. M. Harrison; (June 21) G. E. Burtenshaw.

The folg. P/Os. on probn. are confmd. in their appts. and promoted to war substve. rank of F/O.:—(June 20) R. B. Bryan; (June 22) W. D. Browne; (June 28) W. J. Renwick.

Flt. Lt. M. W. Moore is promoted to rank of Sqn. Ldr. (temp.) (June 1).

The folg. P/Os. on probn. are promoted to war substve. rannk of F/O. on probn.:—(May 15) W. E. Shaw, J. E. de M. Blum; (June 11) T. J. Cadwallader, J. L. Davey.

P/O. J. Facer is granted war substve. rank of F/O (May 8).

Administrative and Special Duties Branch.

The folg are granted commns. for durn. as F/Os. on probn.:—W/Os.: (May 21) S. L. Reeve; (June 2) H. Fallows. As P/Os. on probn.:—W/O.: (July 1) N. E. Hext. As Act. P/Os. on probn.:—Act. W/O.: (June 27) E. T. Crumpton. Flt. Sgts.: J. H. McRitchie, F. B. Sykes. Sgs.: (May 23) J. Graham; (June 27) R. G. B. Mays, T. Molloy, W. Westwood, J. T. Madden. Cpl.: S. E. St. A. James.

The folg. P/Os. on probn. are confmd. in their appts. and promoted to war substve. rank of F/O.:—(June 21) G. Davidson, F. W. D. Grayston; (July 17) S. J. Hargrave.

The folg Act. P/Os. on probn. are graded as P/Os. on probn.:—(May 16) J. S. J. Buels; (May 23) A. W. Warren.

The folg P/Os. on probn. are promoted to war substve. rank of F/O. on probn.:—(May 15) J. A. Haggerty; (June 1) J. S. Deag, L. Simm, N. T. Luce

Equipment Branch.

W/O. C. S. T. Vaughan is granted a commn. for durn. as P/O on probn. (June 2).

P/O. on probn. A. F. C. Donald is promoted to war substve. rank of F/O. on probn. (May 15).

Accountant Branch.

W/O. R. W. Marshall is granted a commn. for durn. as P/O. on probn. (June 20).

The folg. P/Os. on probn. are confmd. in their appts. and promoted to war substve. rank of F/O.:—(June 14) A. Powell; (June 17) C. Bryant; (June 20) T. Phillips; (June 21) E. W. Kirby; (July 3) R. A. Weston.

P/O. on probn. G. F. Caines is granted war substve. rank of F/O. on probn. (Sept. 17, 1940) and confmd. in his appt. (June 15).

The notifn. of June 27 concerning F/O. J. E. S. Salter is substd. for that of June 10.

Medical Branch.

The folg. are granted commns. for durn. as medical officers with the relative rank of F/O.:—(June 13) Mrs. J. G. E.-F. Miller, M.B., B.Ch., D.M.R.E., D.T.M. & H.; Miss E. H. M. Wilson, M.B., Ch.B.

Royal Air Force Reserve

RESERVE OF AIR FORCE OFFICERS.

General Duties Branch.

The folg. F/Os. are promoted to war substve. rank of Flt. Lt.:—(May 17) C. S. Kent; (June 13) H. A. C. Stratton; (July 15) R. H. Rose; (July 17) G. W. Stanhope

Flt. Lt. D. M. Rees, M.B.E. is granted rank of Sqn. Ldr. (Apr. 21)

P/O. C. M. Harris is promoted to war substve. rank of F/O. (June 3).

Flt. Lt. W. T. Walton is transfd. to Administrative and Special Duties Branch (June 14).

Flt. Lt. P. Cannam takes rank and precedence as if his appt. as Flt. Lt. bore date June 3. Reduction to take effect from June 3.

F/O. R. A. Marsh takes rank and precedence as if his appt. as F/O. bore date Jan. 17. Reduction to take effect from June 5.

Flt. Lt. P. E. L. Gethin, A.F.C., relinquishes his commn. in class CC on appt. to a commn. in the R.A.F.V.R. (July 5).

Sqn. Ldr. K. Capel-Cure relinquishes his comma. on appt. to Indian Army (Unattached List) (Jan. 11).

Flt. Lt. J. B. Knapp relinquishes his commn. on account of ill-health (July 15).

Administrative and Special Duties Branch.

F/O. W. Dawson relinquishes his comma. on account of ill-health (Feb. 9, 1940). (Substd. for notifn. of Feb. 13, 1940.)

Royal Air Force Volunteer Reserve

General Duties Branch.

The folg. are granted commns. for durn. as P/Os. on probn.:—Sgts.: (Dec. 11, 1940) W. H. Budd, W. B. Burrows; (Apr. 23) R. W. S. Hayes, B. O. Smith, J. Wood. E. C. Jenvey, L. W. F. Northcroft, W. S. Duffield, J. R. Goldston, J. S. M. Helme; (Apr. 27) J. M. Frost; (May 17) J. Singleton; (May 22) W. T. G. Gabriel; (May 27) C. B. Hunt, A. Y. McC. McCombe; (May 29) A. E. Meadows; (June 5) A. R. Thomas, N. J. Bonnar,

BUOYANT BATTLEWAGON: The aircraft carrier H.M.S. *Ark Royal*, as seen from her attendant destroyer during flying-off operations.

SERVICE AVIATION

R. A. McKinna; (June 10) E. H. C. Kee; (June 12) C. P. J. Wood, P. G. Felce, A. W. Lambert, P. S. Lester M. Russell, L. A. Shawyer, P. J. Bigston, E. A. C. Cowlinng, C. H. Earthrowl, S. R. Andrews; (June 13) L. A. C. Van Arenberch; (June 19) R. A. Lomax, M. A. Beatty, G. E. Yates, N. F. Lowry; (June 26) C. R. Hewlett, D. C. Mitchell. L.A/C.: (Jan. 15) P. P. Vernon; (Feb. 22) G. Fisher, G. K. K. K. Pelmore, R. E. Stont, J. S. Walters, R. G. Woodman; (Mar. 23) N. J. V. Church; (May 11) D. W. H. Walker; (May 17) R. C. Carroll; (May 18) K. J. Macintosh; (May 25) H. M. Clark, A. R. McAra, D. Ellis; (June 19) C. F. Boxall, B. L. Davis, L. F. Evans, M. A. Graves E. L. Marshall, J. B. Parkes, R. A. Prince. J. B. Shillitoe, R. F. Short, D. G. Sega, R. P. Tucker, G. S Walker, J. W. H. Wilson; (June 24) N. N. Allen, C. W. S. Austin, M. V. B. D. Devereux, O. J. H. Hoskins, S. L. Scutt, R. J. V. Smyth; (June 26) G. G. Abraham, C. W. Abrey, D. A. Baker, J. H. A. Baker, D. McL. Crait, G. F. Davey, C. B. S. Fynn, R. L. Hayes, C. T. Holland, T. L. Kaschula, G. MacLagan, W. H. Monson, V. Moss, M. W. O'Brien, R. S. Wheaton.

G. L. Parbury is granted a commn. for durn. as P/O. on probn. (Sept. 16, 1940). (Substd. for notfn. of Feb. 4.)

The folg. P/Os. on probn are confmd. in their appts. and promoted to war substve. rank of F/O.:—(Apr. 1) G. C. Webb; (Apr. 7) P. F. Wakelin; (Apr. 28) I. D. H. Duncan, F. W. Hosken, G. Jones; (Apr. 29) A. W. Donald; (May 12) A. G. Osmand; (June 1) G. C. Turner; (June 2) D. Burrows, A. K. Chappell, M. O. Davenport, G. Hall, G. Newsham, L. L. Pearman, D. E. Street, M. E. Thwaites, D.F.C.; (June 5) J. C. S. Ponsford; (June 8) W. F. Chape, E. A. Rance; (June 9) D. J. Anderson; (June 10) J. D. G. Bishop, I. J. A. Cruickshanks; (June 15) N. L. Haworth-Booth, M. M. Henderson, E. B. R. Lockwood, J. H. N. Molesworth, D.F.C., C. D. Watson; (June 16) R. M. Phillipps, R. Shaw, E. J. Stevens; (June 18) R. E. Jones, E. S. Lock. D.S.O., D.F.C., W. W. McConnell, S. J. Madle, S. N. Rose, W. L. B. Walker; (June 22) G. H. Melville-Jackson, J. Sinclair; (June 25) M. A. Lacayo; (June 26) C. L. Morris; (June 29) A. W. Barwood, R. Baker, J. M. Birkin, K. B. L. Debenham, A. J. Henderson, W. E. Nixon, H. C. Pexton, P. Price, R. H. Rose, E. V. Smith, R. F. Spencer-Schrader, N. F. Waters-Webb, J. Wright; (June 30) N. G. R. Booth, G. A. Holder, R. E. Pope, C. H. T. Short; (July 3) A. J. Glegg; (July 6) H. A. Kidd-May, C. C. Lee, E. G. Outram; (July 9) P. M. Bristow; (July 13) R. C. Dafforn, D.F.C., R. G Guest, B. G. Glover.

P/O. on probn. L. G. Watson is confmd. in his appt. (Apr. 6), and promoted to war substve. rank of F/O. (May 14).

P/O. on probn. F. C. Sutton is confmd. in his appt. (Apr. 20), and promoted to war substve. rank of F/O. (May 15).

P/O. on probn. H. Jacobs is confmd. in his appt. (Mar. 29), and promoted to war substve. rank of F/O. (May 29).

P/O. on probn. C. C. Ellery is confmd. in his appt. (Apr. 12), and promoted to war substve. rank of F/O. (May 29).

The folg. P/Os. on probn. are confmd. in their appts. (Apr. 12), and promoted to war substve. rank of F/O. (June 1):—C. Grant, D. H. T. Lancaster, C. B. Randall, C. A. B. Rome, J. B. G. Stratton.

P/O. on probn. E. G. Curtice is confmd. in his appt. (May 4), and promoted to war substve. rank of F/O. (June 1).

P/O. on probn. D. M. A. Smythe is confmd. in his appt. (Apr. 20), and promoted to war substve. rank of F/O. (June 12).

The folg. P/Os. on probn. are confmd. in their appts. (May 18), and promoted to war substve. rank of F/O. (June 15):—L. M. Blain, R. J. Candy, D. W. Chisholm, E. A. Hinxman, H. J. Jeffcoat, W. Jones, F. C. A. Lanning, D.F.C., G. W. Leonard, G. J. A. Lewis, D. S. Mitus, W. F. P. Webber.

The folg. F/Os. are promoted to war substve. rank of Flt. Lt.:—(June 15) T. V. Mitchell; (June 27) P. G. Agnew, A. B. Wilkinson.

P/O. on probn. A. J. Mackie is transfd. to Technical Branch (Mar. 3).

The folg. are transfd. to Administrative and Special Duties Branch:—F/O.: (July 5) N. H. Sagar. P/O. on probn.: (July 2) A. G. McQueen.

P/O. O. V. Hanbury takes rank and precedence as if his appt. as P/O. bore date Aug. 30, 1940. Reduction to take effect from Apr. 17, 1941.

The commns. of the folg. P/Os. on probn, are terminated on cessation of duty (June 30):—R. H. Bear, G. Kertess.

Technical Branch.

The folg. are granted commns. for durn. as P/O. on probn.:—Cpl.: (June 6) O. Mayer. As Act. P/O. on probn.: (Apr. 30) A. E. Mackinder; (May 4) W. C. Ford; (May 23) W. C. Thompson; (June 2) A. G. Buckmaster; (June 6) D. N. Rands; (June 13) D. G. Butters; (June 20) D. N. Atkinson, E. M. C. Lewis, C. G. L. Maclean, H. Morland, T. Patten. Sgt.: W. Holden.

The folg. P/Os. on probn. are confmd. in their appts. and promoted to war substve. rank of F/O.:—(Jan. 22) C. N. Kington; (Feb. 12) A. W. Sharpe; (Apr. 19) R. E. Shaw; (May 3) H. C. B. Blythman; (May 4) A. J. Buxton; (May 18) M. P. Whitmore; (May 24) W. C. Cropper; (May 25) E. G. Abercromby, G. C. T. Jones, C. H. May; (May 31) J. I. I. David, C. W. K. Mundle; (June 1) J. V. S. Brown, C. L. E. Geach, A.F.C.; (June 7) J. L. Burbidge, G. Cockerham, E. H. Haines, N. Washington (June 18) A. L Fussell; (June 21) L. T. A. Andrews, A. D. Boddam-Whetham, H. H. Bull, D. G. Cooper, D. M. Farquarson, K. R. Midmer, A. D. Knight; (June 24) P. W. Baguley, W. F. Floyd, M. R. Jackson, C. H. Targett, G. S. Woollatt; (June 30) T. A. Rose; (July 5) F. J. Bado; (July 12) G. S. Shaw.

P/O. A. C. Elmy is granted war substve. rank of F/O. (May 1).

The commn. of P/O. on probn. G. F. L. Fischer is terminated on cessation of duty (July 2).

Balloon Branch.

The folg. are granted commns. for durn. as P/Os. on probn.:—Sgts.: (May 30) A. R. N. Hurdman; (June 23) C. E. Dunster. Cpls.: (May 26) W. H. Harris; (June 4) J. H. Atkinson; (June 16) R. W. Morris; (June 18) D. F. C. Hunter; (June 23) A. Sanderson, J. Rankin, D. S. Wolf. A/C.1: R. G. Liddell.

The folg. P/Os. on probn. are confmd. in their appts. and promoted to war substve. rank of F/O.:—(June 39) H. I. Hadley; (July 3) H. S. Mander, M. S. Ashby, L. C. Chappell, W. G. Larman, R. A. Pointon, I. L. Sayce; (July 10) F. H. Toogood; (July 16) J. J. J. Lovelady.

Act. P/O. on probn. L. B. Harvey is graded as P/O. on probn. (June 23).

Administrative and Special Duties Branch.

P. E. L. Gethin, A.F.C., is granted a commn. as Flt. Lt. (July 5, sen. July 17, 1938).

The folg. are granted commns. for durn. as F/Os. on probn.:—(Oct. 7, 1940) G. W. Stephen. W/O.: (June 27) W. M. Brims. As P/Os. on probn.:—(Jan. 6) D. P. Howat; (Jan. 9) J. M. Brander; (Jan. 14. San. Sept. 3, 1939) F. R. Godsmark; (Apr. 15) E. A. Rodway; (May 19) M. A. B. King-Hamilton; (May 23) E. F. Neilson; (May 24) C. R. V. Gray; (June 3) A. S. G. Scott; (June 9) J. F. R. Barker, S. E. Moorhouse, E. S. Armstrong, B. D. Gardner, A. F. Henchy, E. A. Hudson, J. Lawrie, C. Morris, E. W. Pickard, G. R. Shea; (June 13) C. G. Hutchins, V. V. Marshall, F. J. L. Pamment; (June 20) H. W. Bailie, C. G. T. Cooper, G. S. M. Edward, W. Fawdry, J. G. Kilgour, A. Ramsbottom, W. W. Redding, C. W. Reynolds, H. O. Roberts, T. V. Setterfield, W. Simpson, C. Smith, E. S. Smith; (June 30) J. R. Pocock, U. A. Titley. Cpls.: (June 1) N. J. D. Nickalls; (June 4) E. R. Harris. A/C.2: (May 22) B. G. R. Moore; (June 20) C. F. Mulock. As Act. P/Os. on probn.: (June 9) J. H. Clough, J. Crawford; (June 10) Sir A. H. Lindsay-Hogg, Bt.; (June 13) L. A. Moore; (June 20) G. K. Aylward, G. R. Bell, J. Bennett, R. H. Bond, T. N. Critchlow, S. C. Davey, A. W. Day, J. H. Deeley, G. D. S. Dixon, W. T. Griffiths, C. H. G. Hart, S. G. Hewett, G. F. Kelly, H. F. Kelly, W. Murdoch, J. P. Murray, H. Nichol, L. G. D. Pearce, G. A. Raffan, I. C. Rutherford, W. H. L. Swain, H. Walne, L. G. Ward, C. T. Wells, P. S. Wells, D. West, R. W. Whalley, H. D. Wiggins, F. G. Wilde, W. H. Williamson, P. J. Willis, F. J. Willmott; (June 21) F. Hankin; (June 27) J. M. D. Suckling; (June 28) H. W. Gill; (June 30) D. F. Chesters. Flt. Sgt.: (June 27) G. W. Scott. Sgts.: (May 23) S. Shield, H. W. Weeden; (June 13) E. V. Thomas; (June 27) G Ward, D. G. Baker. Cpls.: (May 23) T. K. Evans; (June 27) C. G. Coleman, H. R. Frostick, T. S. James, H. B. Mee, T. A. Shield, J. B. Dangerfield, F. McP. Coles, W. M. Petty, D. McAinsh, R. S. Brown. L.A/C.: C. P. Walter, T. E. W. Evans, A. E. de Neut. A/C.1: (June 13) C. G. Beacham; (June 20) R. H. Willatt; (June 27) H. Lees, A. H. Miller, D. J. Mackenzie, P. G. Spicer, R. G. Jones. A/C.2: L. F. Bayle, H. A. G. Hickox, A. R. Humphreys, H. Mellor, J. Gaston, F. L. Simpson, D. G. Swift, T. W. Thomson, D. W. Harris, L. E. Gatrell, G. D. Dresden, R. E. Hayes, A. D. Sharp, J. F. Jones; (June 28) P. R. H. Tilbury.

R. M. Archibald is granted an hon. commn. as F/O. (July 8).

The folg. P/Os. on probn. are confmd. in their appts. and promoted to war substve. rank of F/O.:—(Feb. 26) H. W. W. Hatch, A. J. Plummer; (Apr. 29) P. P. Grey; (May 4) W. A. Law, A. Rhodes; (May 7) G. B. Anderson, M.C.; (May 11) S. C. Lockwood, J. E. B. Simeon; (May 14) I. M. Matheson, E. M. Mitchell; (May 15) W. H. Hicks; (May 20) W. J. F. Wellard; (May 25) H. W. Hardwick; (May 28) P. C. Blount; (May 31) F. J. Walter; (June 1) H. I. Browning, T. J. Rogers, A. B. Swift; (June 2) T. K. Brown; (June 3) E. S. Gemmel; (June 6) W. G. Eager; (June 7) J. G. Johnston, A. E. Thornton; (June 8) P. A. Rockey; (June 10) S. H. Herman, G. W. Baxter, L. Harrison, T. Laidler; (June 11) H. J. Hayes, M.C.; (June 12) H. A. B. Salmond, J. C. B. Kimber; (June 14) A. L. Murray, R. J. Bevington, F. A. Bird, G. T. Griffith, H. W. Ward; (June 15) H. F. Dempster, G. R. Fairbarns; (June 16) I. G. Paton; (June 17) A. R. Cooper, L. E. De Rouet, J. B. Barratt, H. G. S. Burleigh; (June 18) J. E. D. Manlove, H. E. Wilson; (June 19) H. D. H. Radford, D. T. Summerhayes; (June 20) H. A. Le Bas, A. J. Reincke, R. G. W. Stark; (June 21) R. A. A. Cobb, W. B. H. Eatoa, E. G. Sullivan; (June 22) H. H. Dicken, F. H. Field, W. M. Iles, J. A. Llewellyn Rogers; (June 24) P. H. Maskell, T. Wallace, R. Ellis; (June 25) R. W. W. Palmer, J. Shotter, V. C. Lamb; (June 27) J. P. A. E. Sullivan, G. Wallas, H. Daly, A. E. Stanners, H. U. Everist, L. H. Jones, W. E. Ladd, W. J. Barclay, M.C., R. G. Hartigan, E. H. Brigge, M.C.; (June 28) A. E. H. Banister, J. N. Biggs-Davison, H. Medhurst, A. Roberts, D. E. Roberts, D. A. Dingle, P. R. Hinton, S. Renwick, M.C., E. C. Moorhouse; (June 29) D. F. Martin-Smith, L. H. Spencer, W. W. Winlaw, J. R. Barclay, E. H. Barton, J. G. McIlwraith, W. H. Green, E. V. G. Mackenzie, D. C. Breton, J. Orrell, M.C.; (June 30) C. W. Price; (July 1) A. W. Fagan, C. L. Lachlan, C. K. Squires, J. Lester, F. S. Pincott, H. C. Smith; (July 2) H. N. Walduck; (July 3) A. M. Hill; (July 4) J. B. Rose; (July 5) A. A. F. T. Steavenson; (July 7) C. J. Smith, M.C.; (July 14) B. E. Bishop; (July 15) E. Sankey; (July 18) A. O. Bishop.

The folg. Act. P/Os. on probn. are graded as P/Os. on probn:—(Apr. 11) L. R. Horrox; (Apr. 12) T. H. Raw; (Apr. 22) J. E. Hudson; (May 2) G. R. Wicks; (May 4) T. H. P. Hartley; (May 30) W. W. Prickett; (June 6) F. Sherburn, F. M. Strong, R. D. S. Carpendale, R. V. Church, C. R. Easton, A. Carswell, J. Forrester, J. Todd, J. H. Dollan, F. J. Whitford; (June 13) C. Stockdale, A. H. Pickering, J. A. Rowan; (June 16) K. C. Box, W. G. Webb, T. R. Hardy.

The folg. P/Os. are granted war substve. rank of F/O.:—(Aug. 19, 1940), C. F. Trench. D.S.O.; (Jan. 17) J. M. Reiss; (Feb. 16) T. I. S. Feley; (Feb. 17) D. W. Dobson; (Feb. 19) M. R. Everard; (Apr. 1) W. L. Booty; (Apr. 2) R. C. Clifford-Turner; (Apr. 4) N. W. Waddington, G. W. Gilbert; (Apr. 5) K. Christie, P. S. S. Clark; (Apr. 7) C. G. Maby; (Apr. 10) H. W. Joy; (Apr. 25) P. E. Burrell; (May 1) F. W. Roberts, W. L. Arnold, N. A. Sligh, L. Crossley, E. E. Bullus; (May 7) F. G. Phillips, A. J. L. Skelton; (May 8) C. H. N. Bomford; (May 12) E. L. Rosman; (May 13) W. E. S. Bond; (May 16) S. H. Sullivan.

The folg. P/Os. on probn. are transfd. to General Duties Branch:—(Dec. 2, 1940) G. C. Burnside, J. A. E. Inkster; (Apr. 9) A. Edwards.

The folg. F/Os. relinquish rank of F/O. at own request, and are transfd. to General Duties Branch in rank of P/O.:—(April 26) A. R. Saward; (June 19) W. B. V. N. Wedd.

The folg. are transfd. to Technical Branch:—(Apr. 24, 1940) A. Gillespie (since promoted), F. Boston; (May 29) F. S. Wainscot. P/Os. on probn.:—(June 17, 1940) G. M. Robertson; (May 19) J. Bunton, H. J. McKenzie-Wood, G. H. Pearson, E. H. Sneath, J. Skinner, H. White, M. F. Whitney, F. W. Wort.

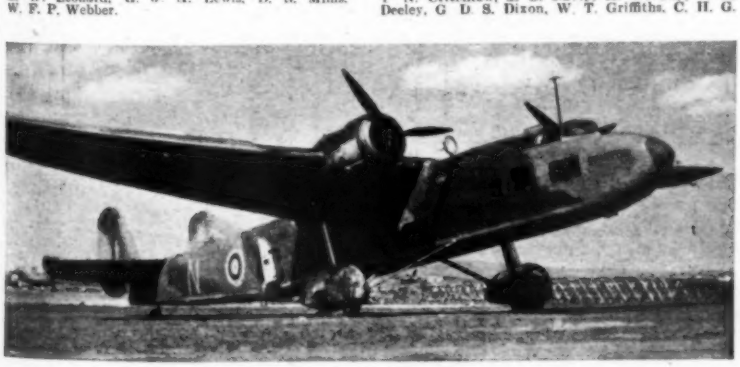
Flt. Lt. H. A. M. Weir takes rank and precedence as if his appt. as Flt. Lt. bore date June 7. Reduction to take effect from June 7.

The folg. relinquish their commns. on account of ill-health:—Flt. Lt.: (July 14) C. B. Matthews. P/Os. on probn.: (July 15) E. Stevenson; (July 16) E. C. Griffin.

Flt. Lt. C. B. Heald relinquishes his hon. commn. (May 31).

The folg. resign their commns.:—Sqn. Ldr.: (July 1) A. B. Austin. F/O. on probn.: (July 7) E. G. J. Byrne. P/O.: (July 9) E. B. Manson.

The commn. of P/O. on probn. R. O. E. Pool is terminated on cessation of duty (June 26).



A BIRD OF PASSAGE: The Sparrow which in its more belligerent days was a Handley Page Harrow heavy bomber.

SERVICE AVIATION

Erratum.

The notifn. of June 6 concerning P/O. on probn. C. Longstaff should have appeared under heading "R.A.F." instead of "R.A.F.V.R."

Meteorological Branch.

H. N. Winwood is granted a comm. for durn. as P/O. on probn. (Dec. 20, 1940). (Substd. for notifn. of Jan. 3.)

Training Branch.

The folg. are granted comms. for durn. as Act. P/Os. on probn.:—(Feb. 1) T. H. Allen, T. G. Armstrong, N. I. Brockbank, D.F.C., R. F. Browne, J. Eastwood, W. Firth, T. Jacques, C. B. Lake, G. W. J. Lane, E. L. Lang, H. G. Mackintosh, A. J. R. Neale, H. W. Nicholson, R. Partington, A. E. Purday, J. B. Roth, A. L. Slater; (Feb. 14) R. C. Chapman; (Feb. 18) J. C. Mason, T. Robertson; (Feb. 22) G. W. Blackburn; (Feb. 25) F. Beevers, D.C.M., M.M., E. Jarratt; (Feb. 28) D. R. Forrester, F. J. Griggs; (Mar. 1) A. H. Duzeley, R. L. Gomersall, F. T. Husband; (Mar. 3) H. W. Harper, R. W. Noad; (Mar. 4) J. J. Bryant, G. Kerswell, H. A. Ross, A. Thorpe; (Mar. 5) R. Wotherspoon; (Mar. 7) W. H. Evans, J. A. Herriott; (Mar. 10) R. E. Appleby, F. Crawford, A. Fowler, A. Lodge, W. S. Whitelaw; (Mar. 11) W. T. Neilson; (Mar. 12) W. H. Jones, F. McDonald, C. J. Thompson, W. C. Treen, M.C., D.F.C., D.C.M., F. B. Whittle; (Mar. 13) W. R. Bilson;; (Mar. 14) T. G. Davies, T. Hargreaves; (Mar. 15) H. Wallhead; (Mar. 17) H. F. Darby, C. T. Parton; (Mar. 18) J. Lessells, F. H. Tippett, W. Wilson; (Mar. 20) E. Allen, W. Sutherland; (Mar. 21) J. Green; (Mar. 22) F. Peters; (Mar. 24) J. Eyers, H. E. Hastie, C. E. Jefferson, J. McNarmara, J. F. Swan, E. J. Thornton, A. Towers, R. L. Wiseman; (Mar. 25) N. V. Clarke, A. Marriner, W. Vannan, N. E. Wallace; (Mar. 27) M. G. Black; (Mar. 28) M. Bailey, J. S. Bancroft, H. J. Cavell, J. P. Crawford, W. G. O'Donnell, L. P. H. Simons; (Mar. 29) C. E. Briant, P. J. Hanglin; (Mar. 31) H. Roberts; (Apr. 3) G. S. Anderson, R. D. Atherton, A. E. Campbell, J. W. Grieve, H. G. S. Howard; (Apr. 4) E. R. Taylor; (Apr. 5) M. Unwin; (Apr. 6) F. E. Gadd, H. J. Harrison; (Apr. 7) J. Hutcheson, A. McCormack, W. Munn, J. Smith, G. A. M. Wilson, A. D. Young; (Apr. 8) B. Hughes, A. M. Murray, W. J. S. Reid; (Apr. 9) L. G. G. Bex, C. Crooks, J. A. Jamieson, D. C. Mabey, R. W. Spratling, H. H. Tyler; (Apr. 10) M. H. Jones, C. J. Pickering, N. Richards; (Apr. 11) C. G. M. Delahunt, H. T. S. Harrison, J. R. Slater, P. S. Whitewood; (Apr. 15) E. G. Kactt; (Apr. 16) E. S. Ashworth, W. E. Rider, M.C., W. Watson; (Apr. 17) R. Billingham, H. F. Boyle, R. S. Fraser, F. E. Giles, H. Macleod, J. I. K. Moyes, J. W. Olson, R. C. I. Overs, R. A. Sinclair, W. B. Thomson, W. H. E. Trewin; (Apr. 18) I. W. Ebben, S. Shaw; (Apr. 19) S. G. Stevens; (Apr. 22) A. H. Blowers; (Apr. 23) O. A. Hughes; (Apr. 24) R. D. Eyles, A. E. Green, H. Morland, W. A. Murray, L. L. Orchard, J. H. Smith, J. A. Taylor Brown; (Apr. 25) J. A. Bowen, J. W. P. Horricks, T. F. Johnson, N. C. Turner; (Apr. 26) W. P. Hardy; (Apr. 28) P. E. Berresford, H. E. Cooke, J. Frost, I. G. F. Harris, J. H. Hopkinson, E. Jackson, A. W. King, V. V. McManus, H. R. Palk, W. E. Swindell, C. Whaley, A. Young; (Apr. 29) J. F. C. Giles, W. C. Jarvis, S. P. Masters, R. Russell, F. C. Wright; (Apr. 30) G. M. Brash, W. Christie, R. Mason, F. D. R. McLaren, J. M. Mitchell, F. Rodwell, R. F. Spalding, H. E. Ward; (May 1) J. H. Davidson, J. E. Fletcher, T. C. Skinner; (May 2) J. Cooper, J. Driver, J. M. Dykes, J. M. Thomas, V. B. Twiss; (May 3) F. H. Eldridge; (May 5) J. M. Carson, C. Cooper, T. E. Drakes, H. E. Mason, W. Seed, G. T. Wheldon; (May 6) A. E. Deans, C. B. H. Lewis, T. Llewellyn, T. J. O. Thomas; (May 7) F. J. Dumphreys, A. Fotheringham, J. E. Haley, J. B. Morris, L. M. Stockdale, T. H. Swailes, A. E. Walsh; (May 8) F. A. Churchley, R. G. Clarkson, F. S. R. Duthie, K. K. Hunter, R. Lindsay, J. M. Milligan, W. Proctor, W. M. A. Reid, J. Sutherland; (May 9) H. E. E. Austen, H. H. B. Cass, E. V. Howells, C. F. Kingham, A. J. Mark, W. J. Morris, S. Morton, W. E. Webb, J. Wilson; (May 10) W. F. Gilbertson, T. P. Lealand; (May 11) H. H. Rolfe; (May 12) S. F. Aubrey, L. B. Aylen, S. Berry, W. A. Clark, J. A. Crawford, R. C. Crawley, T. I. Gill, G. Hay, N. R. Jamieson, G. Johnson, J. Lomax, W. A. Milne, G. Y. Swayne, E. G. Turner, W. M. Young; (May 13) E. R. Bedford, N. A. Birks, E. G. Gilder, R. Jamie, A. J. Maggs, R. M. Murdoch, J. Stark, H. H. Tait; (May 14) D. Barclay, W. C. Clark, J. H. Gray, R. B. Lewis, A. M. Nimmo, E. Stewart; (May 15) W. M. Ogden, W. H. Stephens; (May 16) R. Southan; (May 17) F. A. Noon, W. T. North, A. E. F. Young; (May 19) R. Calrow, E. R. Childe-Freeman, W. R. Heggie, J. R. C. Holmes, R. T. Morgan, W. B. Tudhope, C. Wright; (May 20) H. H. W. Billington, J. F. Brown, R. J. Davey, A. F. Dawes, H. B. Elliot; (May 21) G. W. Anderson, W. P. Conly, S. H. Edwards, A. Effeny, F. L. Freeman, N. M. Hill, S. G. Saunders; (May 22) L. A. Dodd; (May 23) D. J. Barnes, R. P. Marchant, A. H. Mold, H. Smith, H. E. Wykes; (May 24) D. G. M. Robson; (May 26) F. H. Brettell, J. B. Keay, F. T. Kidd, W. H. Maxwell, A. S. McHardy, J. Mitchell, J. N. B. Williams; (May 27) P. Garth, T. Stewart; (May 29) N. McL. Jones, P. Kirkwood; (June 5) P. Hepburn, W. Moncrieff, T. W. Murray, J. W. Peake, R. H. White; (June 6) L. G. Walker; (June 7) F. Ash; (June 11) J. W. Jennings; (June 12) M. N. Barling; (June 13) R. G. Cant.

Equipment Branch.

The folg. are granted comms. for durn. as Act. P/Os. on probn.:—(June 20) R. G. Ashford, W. G. H. B. Barker, E. C. Barrett, S. Chaffey, F. Clark, E. Dann, P. S. Draper, H. J. Edwards, J. D. Evans, H. N. Nelson, J. T. O'Mulloy, L. C. Payne.

The folg. P/Os. on probn. are confmd. in their appts. and promoted to war substve. rank of F/O.:—(June 1) R. E. Cooke, F. de M. Culpin; (June 20) E. D. Kearns.

The folg. Act. P/Os. on probn. are graded as P/Os. on probn.:—(Apr. 18) F. N. Goodall; (May 30) E. A. Bennett, H. P. Bennett, W. H. Coddington, F. P. Coombes, H. Henry, G. H. Hignett, C. S. Lain, A. O. Lewis, G. R. Linley, W. S. M. Long, H. W. Osborn, G. B. Rushton, A. W. Saqui, P. T. Sayer, F. C. Simpson, R. F. Taylor, L. M. Thompson, T. G. Thorne, E. W. Wolfe, K. C. Wright-Watson.

Act. P/O. on probn. L. B. Harvey is transfd. to Balloon Branch (June 23).

F/O. R. C.-H. Horne is transfd. to Administrative and Special Duties Branch (June 30).

Accountant Branch.

The folg. are granted comms. for durn. as P/Os. on probn.:—L.A/C.: (May 21) G. G. Bissell. As Act. P/Os. on probn.: (June 20) B. G. Clouston, A. A. Gray, E. G. W. Hann, L. H. Hosken, G. Morley, G. F. Murdoch, E. C. Nicholson, H. Sanders, H. D. L. Simpson, E. Wearing.

P/O. on probn. R. H. Wills is confmd. in his appt. and promoted to war substve. rank of F/O. (June 20).

The folg. P/Os. on probn. are confmd. in their appts. (May 18) and promoted to war substve. rank of F/O.:- (June 21) J. Fry; (June 22) R. A. Adair.

Act. P/O. on probn. C. E. Sansom is graded as P/O. on probn. (Mar. 14).

P/O. W. H. Martin is granted war substve. rank of F/O. (May 11).

Medical Branch.

The folg. are granted comms. for durn. as Sqn. Ldr.:—(June 13) F. Jannus, M.D., Ch.B., M.R.C.S., L.R.C.P. As F/Os.:—(May 13) F. K. Matheson, M.B., Ch.B.; (June 13) H. L. Campbell, M.B., Ch.B.; A. J. Chiappa-Sinclair, M.R.C.S., L.R.C.P., L.D.S.; A. E. A. Cordin, M.B., Ch.B., D.P.H.; W. O. Davies, M.R.C.S., L.R.C.P.; J. K. Denham, M.B., B.Ch., M.R.C.S., L.R.C.P.; W. F. Dickie-Clark, M.B., Ch.B.; C. Eppel, M.B., B.Ch.; A. H. Fairlamb, M.B., B.S.; M. E. Gordon, M.B., B.Ch., M.R.C.S., L.R.C.P.; L. R. Holt, M.B., B.Ch., M.R.C.S., L.R.C.P.; J. R. Kelly, M.B., B.Ch., D.P.H.; C. W. Lawson, M.B., Ch.B.; W. L. Leslie, M.B., Ch.B.; A. Livingston, M.B., B.S.; J. McMillan, L.R.C.P. & S., L.R.F.P.S.; K. P. G. Mears, M.B., Ch.B.; C. M. Miller, M.B., B.S., M.R.C.S., L.R.C.P.; B. H. O'Dowd, M.R.C.S., L.R.C.P.; G. C. Rae, M.B., Ch.B., D.P. & M.; H. L. Ross, M.B., B.S.; A. A. Smith, M.B., Ch.B.; D. Y. L. Smith, M.B., Ch.B.

The folg. F/Os. are promoted to war substve. rank of Flt. Lt.:—(May 28) J. Jamieson, M.B., Ch.B.; (June 4) A. J. Nimmo, M.B., B.S., M.R.C.S., L.R.C.P.; W. H. Peek, M.R.C.S., L.R.C.P.; W. Selbie, M.B., Ch.B.; (June 11) P. R. B. Grimaldi, M.R.C.S., L.R.C.P.; (June 25) G. N. L. Godber, M.B., B.S., M.R.C.S., L.R.C.P.; W. C. Hoffman, L.A.H., L.M.

The commn. of F/O. J. P. Griffiths is terminated on cessation of duty (June 30).

Dental Branch.

The folg. are granted comms. for durn. as F/Os. (June 13): C. Baines, L.D.S., J. B. Bell, L.D.S., I. H. Cassie, L.D.S., B. Connelly, B.D.S., J. L. Dickson, L.D.S., R.F.P.S., W. H. Dyke, L.D.S., P. H. F. Gaskell, L.D.S., H. W. Green, L.D.S., A. W. Hall, L.D.S., C. Hardwicke, L.D.S., K. J. L. Hollington, L.D.S., G. M. S. McGibbon, L.D.S., A. G. Olver, L.D.S., R. W. Roberts, L.D.S., J. G. Speak, L.D.S., W. R. Spooner, L.D.S., E. Tribe, L.D.S., J. S. Woodhead, L.D.S.

The folg. F/Os. are promoted to war substve. rank of Flt. Lt.:—(June 18) M. K. Butler, L.D.S.; I. C. Lawson, L.D.S.

Chaplains Branch.

The folg. are granted comms. for durn. with relative rank of Sqn. Ldr.:—(Mar. 5) Rev. J. Kerrigan; (Mar. 18) Rev. D. J. A. Mills, Rev. H. Treacy.

Auxiliary Air Force

General Duties Branch.

The folg. P/Os. are promoted to war substve. rank of F/O.:—(June 6) M. G. Pascalis; (June 20) H. G. Niven, J. T. Raffan, D. H. Vandamm.

Women's Auxiliary Air Force

The folg. officers are granted comms. for durn. in ranks indicated (present seniority unaffected). Officers will normally be on probation until they have completed one year's service:—S/O.: (Apr. 25) E. B. A. Stafford. Assist. S/Os.: M. D. Gardner, C. E. Clough, V. F. Lee, P. C. Cragg, M. Concannon, J. L. Barber, K. M. S. Burney, S. K. Churchill, B. M. Clarke, N. R. Cooper, H. K. Little, E. J. Phillips, M. M. Russell, J. S. Dane, O. Turner, N. Villiers, L. M. Evans, J. M. Badgery, F. E. Ball, J. L. Beck, S. M. J. Bowring, P. B. Carpenter, R. Cazes, P. M. F. Cowdy, B. M. Cox, I. M. Craig, S. Eiloart, T. A. Fitzgerald, E. Francis, B. Gillett, E. Hay, M. M. Herbertson, M. N. Holden, B. J. Hulton, I. L. Humphreys, E. A. Leathart, B. E. Legh-Smith, G. D. Lloyd, D. Mackay, B. E. S. Malcolm, S. Ottaway, M. B. Parsons, E. M. Potts, E. A. Preston, R. H. Schofield, M. Scott, C. F. Seabrook, J. M. Spencer, A. V. Sudley, D. E. W. Stokes, J. Stringer, B. H. Thatcher, C. M. Tolhurst, M. L. Wareham, R. Westlake, Wood, P. M. White, T. E. Wigfield, M. C. Wilcockson, V. T. Williams, G. E. Wyatt; (Apr. 26) M. A. Burn, M. J. H. Carey, U. R. Coote, A. David, J. E. Eades, J. Gladwin, M. M. Hall, P. M. Kirke, S. M. Price, K. E. Rolfe-Rogers, C. I. Sellars, S. R. Sherriff, M. U. M. Tedder, A. G. Wilson, J. P. Yeomans; (Apr. 30) K. M. Fitzgerald, D. V. M. Gray, P. Harding, S. D. Adam, P. I. Barringer, W. J. Bishop, J. O. Collins, J. B. Eatough, B. M. Foster, C. M. Geddes, J. Good, B. M. Hogg, D. M. Holman, B. M. Lewis, R. J. Chalmers, E. A. McNeill, M. K. Mitchell, M. Potter, P. D. Robins, H. G. Robinson, E. M. Stone, P. E. J. Ward, I. G. Waugh, N. L. Westbrook, R. K. Wise; (May 5) B. B. Allcorn, E. Armitage, M. H. Ballantyne, F. M. Baxter, D. P. Black, M. P. Bodger, R. C. Bull, M. A. Cook, M. J. Cumella, J. K. H. Cutts, V. Downs, E. J. Fobister, H. M. Hamilton, K. M. Hampson, D. J. Hellings, D. J. Hicks, M. Holliday, R. E. Horstmann, R. J. Howard, N. B. Hume, A. G. Hunter, N. Hustler, Walker, S. F. Ingleby, E. V. Kingham, M. J. Lovett, C. M. Mitchell, A. E. Moore, M. E. O'Beirne-Ryan, G. E. O'Brien, B. Pemberton, D. Pitts, E. V. Riddle, D. E. W. Smith, E. Taylor, R. M. Taylor, M. Walder, P. M. Wallington, B. M. Wardle, A. H. Wilson; (May 10) Abercrombie-Smythe, S. T. Adam, E. D. Brown, S. E. Cameron, E. E. Lewis, P. Liddell, J. F. Muckleston, J. L. C. Rayner, M. I. McC. Sandes, R. C. Ure; (May 17) K. I. B. Chisman, J. Colden, E. P. Edwards, J. B. Fleet, R. Keates, D. I. Le Feuvre, G. M. Peacock, E. M. Reay, J. A. Reid, M. F. Ritchie; (May 19) R. Andain, H. E. Y. Back, M. Bell, G. Boyd, M. K. Briggs, B. D. Bryan, B. K. A. Dawson, I. Dingwall-Fordyce, J. M. Fleman, N. L. Francis, D. G. Fry, S. Fyffe, G. F. Green, E. M. Harding, E. D. Jenney, A. M. Jones, J. F. E. Knowles, M. P. Lee, F. S. Lloyd, M. Mc. Lockhart, V. G. Lockyer, F. A. Lowe, J. G. McKinley, I. S. Martin, V. P. M. O'Reilly, E. M. Pain, I. N. Parkinson, P. M. Pigeon, P. Pye, E. G. C. Ployden, A. P. Prentiss, J. S. Pugh, S. F. Robertson, M. E. Rose, M. E. Rowbottom, M. C. Rylands, C. Spink, I. E. J. Stuart, M. T. Thatcher, A. F. Walker, E. B. Walker, M. A. Waller, I. Warren-Brown, P. D. Wells, P. Wiseman-Herold; (May 24) P. D. Ann, M. N. Booker, L. B. Cargill, V. A. Harriette Inglis, B. H. A. Knight, J. D. Lennox, B. F. Platt, M. M. Stevenson, V. E. Turton, M. Wigglesworth; (May 30) V. T. Bowyer, P. Davies, D. L. Gaisford, M. S. Garland, L. L. Higson, E. Jacobs, S. H. Kent, M. C. Linday, A. M. Masters, M. H. Miller, G. E. Mitchell, J. Morrah, O. M. N. Owen, B. M. Sage, E. P. H. Westbury, M. I. Wright; (June 2) Lady I. M. H. Ashley-Cooper, G. F. Baker, P. M. Baxter, E. D. Box, M. H. Braun, B. C. Bullard, M. S. B. Clifford, R. Crawshay-Jones, V. H. Dudley Ryder, M. E. Guest, B. Harris, E. M. Harrison, J. I. Hedges, M. D. Jones, E. B. McLaren, F. A. May, Q. V. L. Milbank, P. M. Murray, O. V. Roberts, M. V. Setterfield, J. Seymour, J. C. Sharp, F. M. Smith, J. M. C. Smith, Hon. E. Stevenson, E. M. Straus, H. J. Stredder; (June 7) K. E. Ashley, J. G. Bawden, J. M. Blank, H. M. A. Crawford, E. P. Fail, A. I. C. Ferguson, N. A. F. E. Harper, B. I. Harvey, E. M. McPoland, F. H. L. M. O'Brien, J. M. Pritchard, C. M. Rowe, S. J. H. Squair, J. B. Tomes, F. B. Whitby, A. Whitehill, J. B. Winder, M. J. F. Williams; (June 14) M. D. Bass, N. Y. Beard, M. Briercliffe, S. D. Buchanan, I. E. Carver, A. B. Compston, M. H. Corrick, M. G. Dyce, O. R. Evans, M. C. Foxwell, L. M. Frost, B. E. S. Miller, W. LeQ. Mitchell, P. P. Morgan-Morris, J. Oatway, J. C. Rowbotham, R. C. Threlfell.

The folg. are granted comms. for durn. as Assist. S/Os. on probn.:—(June 16) Cpl. M. E. Aubrey, Cpl. J. C. Barr, Cpl. M. L. Barrigan, Sgt. D. K. Benwell, Sen. Sgt. M. Blair, A/CW.1 J. A. Bryan, Sgt. M. J. Bush, A/CW.1 D. J. Cheperton, Cpl. P. Clark, A/CW.1 A. C. Crabbe, Cpl. M. Garlick, A/CW.1 B. M. Guinness, Cpl. I. E. Gunning, Sgt. F. D. Hands, Cpl. C. Hemsworth, A/CW.1 P. M. Henderson, Sgt. E. B. Hill, Cpl. R. M. Hutchesson, A/CW.1 C. Jones, Cpl. J. P. Judge, A/CW.1 C. D. I. King, A/CW.1 M. E. Leslett, Cpl. M. A. Lowe, A/CW.1 F. J. Mannington, A/CW.1 J. Marsden, Cpl. D. Mathias, Cpl. G. E. Miller, Sgt. M. Mowat, A/CW.1 P. J. Muggeridge, A/CW.1 B. H. Ogle, Cpl. M. J. Pollock, A/CW.1 L. M. Phillips, A/CW.1 P. R. Price, A/CW.2 V. M. Ryan, A/CW.1 M. F. C. Shepherd, A/CW.2 G. E. Thornton, Cpl. P. Wilkins, Cpl. M. K. Williamson, A/CW.1 S. Wilson, A/CW.1 E. M. Wright; (June 21) A/CW.1 D. Baker, A/CW.1 V. Broomfield, A/CW.1 E. R. A. Bryan, A/CW.1 C. J. Budgen, Cpl. B. F. Furmedge, A/CW.1 M. P. Goodisson, A/CW.1 J. V. Grant-Crawford, A/CW.1 F. M. Grundy, A/CW.1 E. B. Hammond-Williams, Cpl. B. M. Harrison, A/CW.1 H. Hickman, A/CW.1 H. Hickman, Cpl. M. E. Hughes, A/CW.1 S. Lister, A/CW.1 J. L. F. McGee, A/CW.1 P. B. Mason, A/CW.1 D. L. Maxwell, A/CW.2 G. M. Mitchell, A/CW.1 G. E. O'Brien, A/CW.1 V. B. Pearman-Smith, A/CW.1 S. C. Peterson, A/CW.1 L. M. M. Ross, A/CW.1 C. A. Straker, Cpl. M. H. F. Wingate; (June 28) A/CW.1 M. F. Boaden, A/CW.1 M. I. Booth, Cpl. J. D. Brewster, A/CW.1 J. Bullock, A/CW.1 J. L. Chapman, Cpl. C. B. Crowe, A/CW.1 A. L. Drought, A/CW.1 P. P. Dudding, A/CW.2 J. P. L. Gaskell, A/CW.1 E. A. Heath, A/CW.2 B. R. Jay, A/CW.1 J. E. A. McGinnis, Cpl. Y. A. MacGregor, Cpl. M. E. Price, A/CW.2 S. M. Pugh, A/CW.1 R. J. Rimington, A/CW.1 G. E. K. Sancta, A/CW.1 M. K. Saunders, Cpl. C. L. Taylor; (Jan. Dec. 17, 1940) A/CW.1 D. M. Scarborough.

Assist. S/O. M. E. Abbott relinquishes her appt. on account of ill-health (June 5).